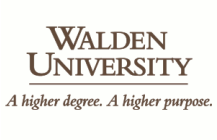

2017

Medical Floor Confusion Assessment Method: Implementation and Assessment of Risk Factors

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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2017

Abstract

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by

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MS, Oregon Health Sciences University, 2004

BS, Walla Walla University, 1987

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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November, 2017

Abstract

An estimated 50% of older hospitalized patients experience delirium. This has created significant complications costing an estimated $164 billion or more per year worldwide. The ability to identify patients developing delirium would allow the implementation of specific interventions to decrease or eliminate the adverse effects of delirium. The purpose of this quality improvement project was to provide high quality delirium education to determine if medical unit nursing staff could successful implement the Confusion Assessment Method (CAM) screening tool to identify patients experiencing delirium as the first phase of an overall plan. Implementation of the project followed Roger's diffusion of innovations theory. Patients were additionally screened for 5 potential risk factors of delirium from the multifactorial model of delirium to determine if delirium could be identified in the local population admitted to a single hospital. With a high quality education intervention, the staff nurses on the medical unit successfully implemented the CAM into their nursing practice and accurately identified delirium. Nurses identified delirium and subsyndromal delirium in 25% of the 208 patients in the study population. Consistent with the literature, patients who had a urinary catheter and experienced an iatrogenic event were predictors of delirium. An additional predictor of delirium, not included in the multifactorial model of delirium, included patients receiving benzodiazepines. This quality improvement project suggests that quality delirium education combined with the use of an accurate delirium detection tool could predict delirium accurately in the medical floor population. This has the potential to reduce the impact of delirium on patients, hospital staff, and reduce hospital expenditures.

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Dedication

This work is dedicated to the amazing nurses, staff, and managers on the medical unit of the project hospital. Without their assistance, this project would never have been possible. Their care, attention to detail, outstanding assessments, and extra effort provided quality data that can produce change that will improve the lives of patients and enhance the care you give on a daily basis.

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Section 1: Nature of the Project

Introduction

Delirium, as defined in the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-V), is an alteration in attention that develops quickly, represents a change in baseline cognitive status, fluctuates in severity throughout the day, and is not attributed to another preexisting neurocognitive disorder (American Psychiatric Association, 2013). The widely recognized subtypes of delirium include hyperactive; hypoactive; and mixed, which is a combination of hyperactive and hypoactive (Martins & Fernandes, 2012; Saxena & Lawley, 2009). Researchers, Saxena and Lawley state that patients in the hyperactive state of delirium often exhibit hyper-vigilance, restlessness, aggression, agitation, and labile moods. In the acute care setting, the researchers describe patients who remove intravenous lines, urinary catheters, climb out of bed, fall, and sustain potentially serious injuries. They suggest this disruptive behavior was previously associated with adverse effects from medications or withdrawal states. The researchers add that staff have often missed identifying hypoactive delirium when patients present as withdrawn, lethargic, apathetic, or mildly confused. The patient demonstrating hyperactive psychomotor activity interspersed with hypoactive motor activity indicates the development of the mixed type of delirium (Saxena & Lawley, 2009). The hypoactive form of delirium has been thought to be more prevalent among medical-surgical (MS) patients; however, often unrecognized (Flagg, Cox, McDowell, Mwose, & Buelow, 2010).

One additional form of delirium not recognized in the *DSM-V* is subsyndromal delirium. In this case, the patient has several symptoms associated with delirium such as

an acute change in mental status and unorganized thinking; however, does not show signs of inattention (Morandi et al., 2012). Subsyndromal delirium, Morandi et al states, lies on a continuum between minor confusion symptoms and delirium and occurring just prior to the diagnosis of delirium. This type of delirium is often prevalent in nonintensive care settings (Morandi et al., 2012). It is necessary to analyze the intricacies of delirium in order for the nursing staff to quickly recognize the disorder at the bedside and mitigate subsequent complications.

Problem Statement and Relevance to Practice

Patients aged 65 and older account for 45% of hospital admissions (Huang, Larente, & Morais, 2011). Delirium affects an estimated 50% of elderly hospitalized patients (Carr, 2013; Inouye, Westendorp & Saczynski, 2013). Analysis of the prevalence of delirium in a systematic review conducted by Inouye et al. (2013) suggested that between 29% and 64% of elderly patients on MS units develop delirium. However, the authors stated that accurate prevalence figures were difficult to obtain since a significant number of delirious episodes were not recognized.

Delirium and the subsequent consequences are expensive. Overall delirium is associated with increased length of stay, increased falls, cognitive and functional decline, increased 30-day readmission status, institutionalization, and increased mortality (Cole, Ciampi, Belzile, & Zhong, 2009; Harlein, Halfens, Dassen, & Lahmann, 2010; van den Boogaard, Schoonhoven, van der Hoeven, Achterberg, & Pickkers, 2012; Witlox et al., 2010). Also, associated with the consequences of delirium is a significant increase in costs to care for these patients. Saxena and Lawley (2009) estimated that delirium costs

$2,500 more per patient totaling $6.9 billion in annual Medicare dollars spent in 2004. Inouye et al. (2013) stated current hospital costs were closer to $164 billion a year in the United States and a staggering $182 billion per year in 18 European countries. Putting these expenditures into perspective, national health care costs for nonfatal falls were estimated at $30 billion (Centers for Disease Control and Prevention [CDC], 2013a), diabetes were estimated at $245 billion (American Diabetes Association, 2013), and cardiovascular disease at $312.6 billion (CDC, 2013b). Acknowledging that the different entities may have figured costs differently, delirium certainly represents a significant expenditure of healthcare dollars.

While there has been significant research conducted regarding the identification and management of delirium in the intensive care unit (ICU), there has been little research concerning best practices for the MS patient experiencing the subsyndromal or hypoactive forms of delirium. Education, assessment tools, and evidence-based interventions need development to meet the needs of the patients on the MS unit. My initial step in developing an overall comprehensive delirium management plan was to address the difficulty associated with the identification of delirium. The nurse manager at the project hospital expressed that the medical floor nurses felt ill equipped to meet the needs of their geriatric patients experiencing delirium due to lack of knowledge and education to identify the multiple forms of delirium. Additionally, there have not been risk assessment tools specifically developed for general MS units who admit a wide variety of patients (Hall, Meagher, & MacLullich, 2012).

Quality Improvement Process and Change Theory

Lynn et al. (2007) defined the quality improvement process as a data-guided activity that is systematic in nature and designed to improve the delivery of health care. In this project, I assessed the ability of the medical floor nursing staff to accurately administer and efficiently utilize the confusion assessment method (CAM; Inouye et al., 1990) as part of the assessment process to provide early recognition of delirium. Developed through research as an educator in the communication field, Rogers' diffusion of innovations theory (2003) was the change framework I utilized for this quality improvement project. The diffusion of an innovation through communication is the basis for this theory.

Traditionally, anthropology, early and rural sociology, education, public health and medical sociology, communication, marketing and management, geography, and general sociology research have been typical fields applying Rogers' theory (Rogers, 2003). However, more frequently the theory has found a home in nursing research. For example, Brown, Wickline, Ecoff, and Glaser (2009) used the theory to describe the relationship between nurses' attitudes, practice, and knowledge to the perceived facilitators and barriers to the acceptance of evidence-based practice. Specifically, related to early identification of delirium, Russell-Babin and Miley (2013) utilized Roger's theory to implement delirium evidence-based practices into early identification of delirium in patients receiving hip surgery. Nilsen (2015) described Roger's diffusion of innovations theory as being the most singularly influential theory in regards to knowledge utilization.

Rogers (2003) defined diffusion as the process of communicating an innovation through specific channels to individuals or organizations over a certain timeframe. There are five phases involved in the process that include knowledge, persuasion, decision, implementation, and confirmation according to Rogers. He states that prior to working through the five phases is a period known as, prior conditions, during which time previous practices, perceived needs and problems, innovativeness, and norms of the social system need to be analyzed. Rogers' states that knowledge and characteristics of the decision-making unit are concepts under consideration within the first stage, and those characteristics include socioeconomics, personality variables, and communication behaviors. Examination of the perceived attributes occurs in the persuasion stage, and these attributes include relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003). During the last three phases of decision, implementation, and confirmation, the focus is on adoption or rejection of the innovation according to Rogers. Adopters will initially embrace the change and progress through to complete confirmation of the innovation or they will discontinue the innovation and revert to previous norms. Rejecters will initially not embrace the change and continue to reject the innovation through the confirmation process or after initial rejection; they will progress into later adopters (Rogers, 2003).

My initial analysis of the medical stroke unit, where the innovation took place, focused on previous practices regarding delirium identification, the need of the unit to identify patients with delirium, and the problems the unit was experiencing with respect to increased cost related to sitter use and a significant number of falls. The nurses on this

unit initiated the change process by expressing a need to learn how to identify patients with delirium. During the knowledge acquisition phase, the medical floor staff learned about the prevalence of delirium, the subsequent consequences related to untreated and undiagnosed delirium, and the protocol for the administration of the CAM. The staff began to develop positive opinions regarding the innovation during the persuasion phase as the unit manager, unit educator, stroke unit coordinator, and hospital administration championed the need for change on their unit. According to Rogers' theory (2003), the five attributes of the innovation contribute to the willingness of individuals (nurses in this quality improvement project) to implement the new practice. These included a perceived advantage of the innovation over the status quo; the compatibility of the innovation with the current needs, values, and experiences of the nurses; the complexity of the innovation; the ability of the innovation to be tested; and the visibility of the results. In order to promote the successful adoption of the innovation, nurses acquired knowledge, developed a change in attitude as they perceived an advantage to changing practice, used the decision-making process to understand the complexity of the innovation, implemented the innovation through frequent testing, and finally, confirmed the visibility of the innovation through being able to identify patients with delirium.

Completion of the decision-making process occurred when the medical floor staff made the decision to accept the innovation after thoroughly evaluating the attributes of the innovation. During the implementation process, the medical floor staff began the integration of the innovation to assess each patient for delirium using the CAM. The

final confirmation occurred when the medical floor staff accepted and recognized the value and benefit of the implementation of the CAM and integrated it fully into practice.

This quality improvement project was the initial phase of my comprehensive delirium management plan. Phase 2, occurring beyond the scope of this project, will include the implementation of the CAM on all hospitals units. Following the implementation of Phase 2, will be the implementation of delirium-specific interventions based on a positive CAM result, to mitigate the subsequent complications of patients developing delirium.

Implications for Social Change in Practice

The estimated incidence rate of preventable delirium in elderly hospitalized patients is 30–40% (Westendorp & Saczynski, 2013). Showing that this situation has reached the national stage, Healthy People 2020 has identified delirium as a specific issue when addressing national health promotion and disease prevention in elderly patients (U.S. Department of Health and Human Services, 2010). Older adults are at a significantly increased risk of experiencing delirium when hospitalized (U.S. Department of Health and Human Services, 2010). If delirium education and the use of an assessment tool could predict delirium accurately, healthcare organizations using this delirium detection tool could potentially prevent delirium altogether, or reduce episodes of delirium, and implement evidence-based geriatric sensitive treatment quickly. Early intervention could lead to a decrease in hospital expenditures; less stress and nurse burnout; and improved patient outcomes such as decreased falls, minimal need for

restraints or constant observation, shorter length of stay, decreased mortality, and decreased 30-day readmission rates.

Purpose Statement and Project Objectives

The purpose of this quality improvement project was two-fold. The first was to provide quality delirium education to the nursing staff so that they could successfully implement the use of the CAM into the daily assessment plan of medical floor patients to identify patients experiencing delirium. The second purpose was to determine if the five precipitating factors for delirium development, described by Inouye and Charpentier (1996), were present in the local population of the medical unit of the project hospital. Therefore, my first objective with this quality improvement project was to provide a high quality educational intervention that would enhance nursing knowledge related to delirium and teach the implementation of the CAM so that nurses could successfully identify patients with delirium using the CAM. My second objective was to determine if this patient population possessed any of the five precipitating risk factors described by Inouye and Charpentier. Reducing the prevalence of delirium, through early detection, would lead to reduced hospital costs and the more effective use of valuable resources by decreased length of stay, decreased use of restraints, decreased need for sitters, decreased fall rate, and diminished 30-day readmission rates (Carr, 2013; Reston & Schoelles, 2013).

Project Questions

My objectives with this project were to answer the following questions:

Question 1: After receiving high quality delirium education, could the medical floor nursing staff implement the use of the CAM into the daily assessment plan of medical floor patients and successfully identify delirium in the study population?

Question 2: Are any of the five independent predictors of delirium identified by Inoyue and Charpentier (1996) identified in the local population?

Definition of Terms

Delirium: For the purposes of this project, delirium was defined as an alteration in attention that developed quickly, represented a change in baseline cognitive status, fluctuated in severity throughout the day, and was not attributed to another preexisting neurocognitive disorder (American Psychiatric Association, 2013). The presence of delirium is established if the patient met the criteria for delirium using the short form of the CAM developed by Inouye et al. (Waszynki, 2007).

Medical/surgical (MS) patients: Within the scope of this project, MS patients are defined as all adult patients admitted to third floor medical stroke unit at the project hospital during the project period. The third floor medical unit comprises three nursing units. I utilized the stroke and overflow medical unit for this quality improvement project.

Risk factors: Five risk factors identified as independently predicting delirium were greater than three medications added in a 24-hour period, the development of an iatrogenic event, malnutrition, use of physical restraints, and use of a urinary catheter (Inouye & Charpentier, 1996). The definitions for each risk factor were identified from their study.

Greater than 3 medications: Adding more than three medications was defined as the physician ordering three or more new medication types for the patient within a 24-hour period.

Iatrogenic events: Iatrogenic events are illnesses that result from a therapeutic intervention, diagnostic procedure, or an unexpected or unnatural event not related to the patients admitting diagnosis. These events were categorized as cardiopulmonary, hospital-acquired infections, medication-related complications, an unintentional injury, complications from diagnostic or therapeutic procedures, or other events such as a pressure sore or bowel obstruction.

Malnutrition: Malnutrition was defined as a serum albumin level less than 30 g/L.

Physical restraints: Physical restraints were defined as any device designed specifically to decrease the ability of the patient to move.

Urinary catheter: A urinary catheter was defined as any device inserted internally to collect urine.

Assumptions and Limitations

According to Polit and Beck (2006), an assumption is a basic concept accepted by a majority of people as being fact; however, the fact has not been proven or verified. Limitations are potential conditions that occur outside the control of the researcher, which may influence the results of the quality improvement project, according to Polit and Beck. This quality improvement project included several assumptions and limitations.

Assumptions

To provide transparency, I defined several basic assumptions to ensure common understanding of given situations and reduce potential misunderstandings. First, I assumed that the CAM accurately identified a patient experiencing delirium. My second assumption was that once the proper education was provided, MS nurses were able to administer the CAM accurately. Finally, I assumed that the nurses were able to accurately track and record the five independent risk factors identified by Inouye and Charpentier (1996).

Limitations

I identified several known limitations prior to beginning this project. The first was that data collection occurred at a single community, nontertiary care hospital. Secondly, in 2014 at this hospital, I only identified 68 patients with delirium based on a review of medical records. This number represents less than 1% of the total number of patients admitted to this hospital per year and is significantly less than published reports indicating that 50% of hospitalized patient have delirium (see Carr, 2013; Inouye et al., 2013). This suggested that delirium was significantly undiagnosed in this population.

Summary

Delirium prevalence in the elderly is significant. Even more concerning is that delirium is often undiagnosed, leading to low reported incident rates (Carr, 2013). Compounding unrecognized delirium is the lack of education provided to the nurses regarding delirium and the minimal training in the use and administration of the CAM to identify those at risk for or who may have developed delirium during their hospitalization

(Holly, Cantwell, & Kamienski, 2013). Nurses at the project hospital expressed concern that they were unprepared to identify and care for this population of vulnerable elders. Patients who experience delirium generate costly hospital stays due to a variety of potential complications (Harlein et al., 2010; van den Boogaard et al., 2012). In this project, I addressed the need for delirium education and early recognition of delirium to minimize the subsequent complications of delirium. Next, a thorough review of the delirium assessment literature focuses on how nursing assessment alone is inadequate for identifying delirium, the importance of accurate delirium detection tools, and an analysis of risk factors that may contribute to the development of delirium specifically in the MS population.

Section 2: Review of Literature and Theoretical Frameworks

Introduction

There has been a significant gap in the current research regarding the identification and management of delirium in the MS patient experiencing subsyndromal or hypoactive forms of delirium. In this literature review, I will provide a synopsis of the limited ability of nursing to identify the development of delirium, lack of delirium assessment tools for the MS population, and the variety of risk factors associated with delirium. Analysis of these factors must occur in order to implement a plan to mitigate the subsequent consequences of the development of delirium.

Search Strategy

My literature search strategy first involved the identification of potential search terms, which included *delirium, hypoactive delirium, hyperactive delirium, mixed*

delirium, subsyndromal delirium, acute confusion, confusion, MS patients, risk factors, prevalence, incidence, elderly, risk assessment tools, early detection, prediction tools, and *delirium assessment tools*. I searched multiple databases and search engines including CINAHL Complete, HealthSource, PubMed, and Google Scholar. Each database contained links to additional studies and an analysis of the references of each study lead to further potential studies. I also included articles and studies available in English and published since 2006, with the exception of several seminal studies from the late 1990s. Systematic reviews were preferred.

Theoretical Framework

The multifactorial model of delirium (Inouye & Charpentier, 1996) was the overarching framework for this quality improvement project. In this model, Inouye and Charpentier assumed that delirium is the result of multiple factors and not caused by just one factor or event. The researchers proposed a relationship between the vulnerability of the patient at baseline and factors or events that occurred during hospitalization that precipitated the development of delirium. A patient who is highly vulnerable to the development delirium, according to the researchers, is one who is at risk at admission due to cognitive impairment or who is severely ill but experiences minimal precipitating factors during hospitalization. Conversely, a patient with low vulnerability would be less likely to develop delirium even with significant precipitating factors during hospitalization related to their environment or disease process, according to Inouye and Charpentier. Thus, identifying patients with high vulnerability and multiple precipitating

factors was necessary to provide appropriate interventions to mitigate the adverse effects of delirium (Inouye & Charpentier, 1996).

In the multifactorial model of delirium, Inouye and Charpentier (1996) included five independent precipitating factors for predicting the development of delirium. The first factor was the use of physical restraints (Relative Risk [RR] 4.1; 95% CI 2.5–7.9), which they found to be associated with the risk of developing delirium. The researchers also found malnutrition (RR 4.0; 95% CI 2.2–7.4), as measured by serum albumin level of less than 30 g/L, to be associated with the risk of developing delirium. Greater than three medications added in a 24-hour period (RR 2.9; 95% CI 1.6–5.4) was based on the total number of medication types received during each day and was also found to be associated with the risk of developing delirium by the researchers. The authors also found that the use of a urinary catheter (RR 2.4; 95% CI 1.2–4.7) increased the risk for the development of delirium. Finally, they found that, any iatrogenic event (RR 1.9; 95% CI 1.1–3.2) increased the risk of developing delirium. Defined iatrogenic events were cardiopulmonary complications, hospital-acquired infections, medication-related complications, unintentional injury, complications of diagnostic or therapeutic procedures, or simply as other, and these events were determined to have preceded the development of delirium by at least 24 hours and independently predicted increased risk for delirium according to the researchers. Implementation of interventions to decrease the development of delirium could theoretically come through the identification of these modifiable risk factors (Inouye & Charpentier, 1996).

Delirium Assessment Literature

Nursing Assessment Alone

Researchers have indicated that nursing assessment alone is not enough to identify delirium accurately and that delirium detection tools should be included as part of the nurse's clinical decision-making process (Mistarz, Eliott, Whitefield, & Earnest, 2011; Rice, Bennett, Gomez, Theall, & Foreman, 2011). Mistarz, et al., (2011) conducted a single center observational study in an ICU. Their objective was to determine if bedside interactions between the nurse and the patient were sufficient for determining delirium. The researcher's analysis of 35 matched assessment nurse-patient interactions yielded a correct delirium diagnosis 27% of the time, whereas 72% of the time the nurse did not identify delirium when it was present. They indicated this might have been from lack of education, the nature of the interactions, or difficulty in recognizing fluctuating hyperactive and hypoactive delirium.

Continuing with the theme of underrecognition of delirium, Rice et al., 2011 conducted an observational study using a convenience sample of 167 MS nurses. Their objective was to measure the ability of the staff to detect delirium as compared to nurse researchers using the CAM. In their study, nurse-researcher pairs assessed 170 MS patients every other day until either discharge or confirmation of delirium. The researchers confirmed delirium in 12 of the patients and of those 12 patients, the nurses only detected delirium in three. Both of these studies (Mistarz et al., 2012; Rice et al., 2011) demonstrated there was significant underrecognition of delirium without the use of an assessment tool.

Continuing the theme of underrecognition of delirium but analyzing the lack of delirium education and understanding of patient consequences related to the development of delirium, Flagg et al. (2010) conducted a descriptive cross-sectional study using a convenience sample of 61 nurses from two midwestern hospitals to describe their ability to recognize delirium. The researchers developed and administered the Barriers to Delirium Assessment survey during this study and content validity and internal consistency reliability scores were 0.81, 0.87, and 0.87 for each of the three sections of the survey. The first section of their survey measured nurses' knowledge of delirium outcomes and was comprised of 13 true and false statements. The second section of the survey measured overall delirium knowledge measured by rating eight items on a 5-point Likert scale. The third and last section of the same survey measured the nurse's confidence in recognizing delirium and evaluated through three items rated on a 5-point Likert scale. Their results showed that 79% of the nurses understood that delirium was a problem and 90% could identify hyperactive symptoms; however, only 77% could identify hypoactive symptoms. A significant number of nurses in the study were unaware that patients who were alert and oriented also required delirium assessment and many did not have confidence in their ability to identify, manage, or explain delirium to patients and family members. The researchers suggested that assisting nurses to understand the negative outcomes associated with delirium would encourage them to value the importance of early detection.

Finally pulling the themes of underrecognition and lack of delirium knowledge together Agar et al. (2011) conducted a qualitative study in an Australian public hospital

using semistructured interviews with 40 participating nurses to determine their views regarding delirium assessment and management following a grounded theory perspective. The four main themes that emerged in their study included (a) a poor understanding of the definition of delirium; (b) difficulty with nursing assessment in determining whether to investigate why changes were happening versus solving the issues as they were happening; (c) maintaining dignity and minimizing the subsequent consequences associated with the development of delirium; and finally, (d) dealing with the distress of the patient, the family, and those caring for the patient. The results of their study suggested that more education was necessary to enhance knowledge translation to align nursing care with the latest evidence-based practice.

Delirium Assessment Tools

Based on the research, nurses, due to a lack of delirium education and the nonuse of delirium detection tools, underrecognize delirium (Agar et al., 2011; Flagg et al., 2010; Mistarz, et al., 2011; Rice et al., 2011). A variety of delirium detection tools exist in current practice. Typically, physicians and trained nurses administer these delirium detection tools to patients in the ICU. Sensitivity and specificity testing of these tools on the MS population is minimal. In conjunction with appropriate training for nurses, a delirium detection tool that accurately identifies delirium in the MS population is key to mitigating the impact of delirium.

Holly et al. (2013) conducted a systematic review to identify best practices for identification, screening, and prevention of delirium in elderly patients. While they analyzed 13 systematic reviews, only three related to screening tools. The authors

suggested that only the CAM, CAM-ICU, and Neelon and Champagne Confusion Scale (NEECHAM) were validated for use by nonphysicians. The researchers state the CAM is a diagnostic algorithm based on four elements: (a) mental status that fluctuates and is acute in onset, (b) inattention, (c) disorganized thinking, and (d) altered level of consciousness. The diagnosis of delirium is determined when the patient exhibits a fluctuating mental status and inattention along with either disorganized thinking or altered level of consciousness according to the researchers. They stated that the CAM-ICU is a modified version of the CAM for the critically ill patient and accounts for the fact that the patient may not be able to respond verbally but could answer questions through hand gestures. The same scoring of diagnostic criteria as the CAM determines whether the patient has delirium, according to the researchers. They suggest the Nursing Delirium Screening Scale (NU-DESC) is based on the CAM; however, adding in psychomotor retardation as the fifth component. The researchers stated a score of three or above indicated the presence of delirium. Continuing in the same study, the NEECHAM confusion scale consists of three levels of scoring: (a) Level 1 scoring includes processing factors such as attention, command, and orientation and includes multiple levels within these parameters; (b) Level 2 scoring includes appearance, motor, and verbal behaviors again with multiple sublevels; and (c) Level 3 scores account for vital function stability, oxygen saturation stability, and urinary continence control. Adding the scores together from each level, a score from 0–19 indicates moderate to severe confusion, 20–24 indicates mild to early development of confusion, 25–26 indicates not confused but at a high risk for confusion, and scores of 27–30 indicates

normal functioning according to the researchers. In analyzing the available tools (CAM-ICU, CAM, NU-DESC, and NEECHAM), the researchers determined that the CAM and CAM-ICU maintained the highest sensitivity (between 46% and 100%) and specificity (89%–98%) scores and were the most widely used. However, they did suggest that sensitivity scores could improve with solid training on the use of the tool prior to implementation. This would indicate that nurses could use these delirium detection tools, particularly the CAM and CAM-ICU, to identify patients with delirium.

Grover and Kate (2012) analyzed 40 available delirium assessment scales. The authors compared scales used in research versus the clinical setting; identified usefulness for screening, diagnosis, and severity; and provided an analysis of diagnostic criteria. Their results suggested that the Delirium Rating Scale-Revised-98 (DRS-R-98) is a solid and comprehensive instrument that works well for diagnosis, can be useful in analyzing delirium severity, and is sensitive to change over time. However, due to accuracy and brevity, they considered the use of the CAM the superior diagnostic scale, as did Holly et al. (2013). The researchers did note, however, that the validity of the CAM was lower when used by nurses. Concurring with the theme from Holly et al., (2013) they also suggested ways to improve training for nurses and proposed conducting additional research on subtypes and risk factors of delirium to mitigate underrecognition of delirium (Grover & Kate, 2012).

Continuing with the theme of adequate training in conjunction with evaluating the accuracy of the delirium detection tools, Shi, Warren, Saposnik, and MacDermid (2013) conducted a study to evaluate the diagnostic accuracy of the CAM and the CAM-ICU

compared to the *DSM-IV*'s analysis of delirium in 22 different studies. Their results showed pooled sensitivities for the CAM were 82% (95% CI 69%–91%) and 81% (95% CI 57%–93%) for the CAM-ICU. Specificity was 99% (95% CI 97%–100%) for the CAM and 98% (95% CI 86%–100%) for the CAM-ICU. They determined that administration of both tools could occur within 10 minutes by trained clinical or research staff. As with the previous studies (Grove & Kate, 2012; Holly et al., 2013), the researchers stated that diagnostic tools should not replace clinical judgment, that adequate training was necessary to administer both the CAM and CAM-ICU, and that these two delirium detection tools had the best accuracy (Shi, Warren, Saposnik, & MacDermid, 2013).

Further supporting the importance of accurate delirium detection tools, Schuurmans, Deschamps, Markham, Shortridge-Baggett, and Duursma (2003) conducted a systematic review of instruments designed to measure delirium and available at the time of the study. They reviewed 13 instruments and determined that the NEECHAM Confusion Scale, Delirium Observation Screening (DOS) Scale, and Memorial Delirium Assessment Scale (MDAS) were the easiest to administer, and had appropriate validity and reliability scores. The authors preferred the fact that the NEECHAM confusion scale required only one shift of patient observation while the DOS required observation of patient behaviors for three consecutive shifts. However, the researchers suggested that the NEECHAM confusion scale was a better measure of confusion than delirium. They further indicated that thorough staff training, improved clinical observations by spending more quality time with the patient, and including information obtained from talking with

family members were necessary to improve the consistency of the CAM. This research highlighted the importance of an accurate tool combined with the quality education necessary to administer the tool.

Radtke et al. (2010) supported the theme of accurate delirium detection tools and staff training; however, focused on a smaller segment of the MS population. The researchers conducted an observational study in a German hospital to validate a delirium detection tool for use in postoperative patients. Their study included 116 patients screened with three different assessment tools against the gold standard of the *DSM-IV* criteria for delirium through the sixth postoperative day. The three different assessment tools they evaluated were the Delirium Detection Score (DDS), the CAM, and the NU-DESC. The interrater reliability in their study was 0.83 for the Nu-DESC, 0.77 for the DDS, and 1.00 for the CAM. They describe the DDS as a system that scores five areas including orientation, hallucinations, agitation, anxiety, and paroxysmal sweating. Each item is given a severity score (0–7) and a sum of eight or more signifies delirium according to the researchers. In their study, the sensitivity and specificity were 0.71 and 0.87 for the DDS, 0.75 and 1.00 for the CAM, and 0.98 and 0.92 for the NU-DESC, when compared to the gold standard of the *DSM-IV* criteria. The researchers concluded that the NU-DESC was a more sensitive test for post-operative delirium; however, all three tools showed high specificity. This result was different from findings of the previous studies; however, this study was specific to patients with post-operative delirium.

Following in the theme of Radke et al. (2010), Duppils and Johansson (2010) conducted an observational study to determine if the NEECHAM confusion scale could correctly identify patients at risk for developing delirium. Observations occurred daily for the development of delirium in 149 patients, aged 65 and older, who had undergone surgery for a hip fracture during their study period. They used the NEECHAM confusion scale at admission and prior to discharge. Using *DSM-IV* criteria, they found that 24% of the patients developed delirium. Participants scoring less than 25 points on the NEECHAM confusion scale had a 12 times higher risk of developing delirium according to the researchers. They stated the sensitivity of the NEECHAM confusion scale on admission was zero due to the exclusion of all patients with delirium and specificity was 75%. At discharge, sensitivity was 100% and specificity was 91%, leading the authors to conclude that the NEECHAM confusion scale was valid and reliable for predicting delirium in posthip surgery patients, confirming the findings of Radtke et al., 2010.

Continuing the focus on the accuracy of specific delirium detection tools based on patient population, Neufeld et al. (2011) conducted a prospective comparison study of 139 patients on two medical oncology units in a large teaching hospital. Researchers compared a neuropsychiatric examination with the CAM-ICU and the Intensive Care Delirium Screening Checklist (ICDSC). Thirty-six patients (26%) experienced at least one day of delirium, 21 (15%) were admitted to the medical unit with delirium, and 15 (11%) developed delirium when assessed with the neuropsychiatric examination according to the researchers. They found that the CAM-ICU diagnosed 3% initially and 4% after repeated daily assessment. By contrast, they found the ICDSC identified 10%

of patients diagnosed with delirium initially and 16% after repeated assessment. Researchers concluded that delirium detection tools designed for the ICU were not adequate for use outside the ICU. In determining the choice of an accurate delirium detection tool, it is important to analyze that tool for use in multiple populations and settings. Tools designed for one population may not be effective for another population or setting (Neufeld et al., 2011).

Neufeld et al. (2014) conducted another study to describe the variety of methodologies utilized to diagnose and evaluate delirium as reported in multiple research studies. The researchers used a web-based survey to question the authors of 33 of 39 eligible studies from 1990 to 2012 regarding methodology. Most of those using delirium detection tools were physicians (79%) with a mean of 7 years' experience with diagnosing delirium according to the researchers. They reported that only 7% of delirium reference raters were nurses; however, seventy percent of the studies used interrater reliability to evaluate reference raters. The researchers found that 20 studies (61%) used cognitive tests to diagnose delirium, 15 studies (45%) used at least one delirium detection tool, and 11 studies (33%) used both cognitive tests and delirium detection tools. They reported the most frequently used delirium detection tools were the CAM, the MDAS, and the CAM-ICU. The authors stated that there was significant variability in methods used to detect delirium and suggested that standardization of the diagnosis itself would improve recognition. The researchers also suggested improving the percentage of documentation of interrater reliability. Again, delirium education to improve knowledge,

accurate delirium detection tools, and quality training to use the tools are necessary to detect underrecognized delirium (Neufeld et al., 2014).

Risk Factor Literature

Complicating the picture beyond having adequate training and accurate detection tools is the variety of risk factors associated with the development of delirium. Inouye and Charpentier (1996) conducted a prospective cohort study on two general medical units in a university teaching hospital. The purpose of their study was to analyze the relationship between precipitating factors and the development of delirium and to develop and validate a predictive model based on those factors. Researchers compared 196 patients who were aged 70 or older without delirium as the baseline with 312 comparative patients for new-onset of delirium by day 9 of hospitalization. They reported that delirium developed in 18% of patients with the five independent precipitating factors as reported previously. The researchers concluded that these five independent factors were statistically significant and predicted patients at risk for the development of delirium. This was one of the first major studies analyzing risk factors and generated further research by other authors.

Elie, Cole, Primeau, and Bellavance (1998) followed with a systematic review of risk factors noting the difficulty in identifying risk factors due to inconsistent results from multiple different populations. They analyzed 1,365 subjects from 27 studies published between 1966 and 1995. Nine of the studies occurred on surgical units, 11 of the studies on medical units, and two studies were on combined MS units. Using the Mantel-Haenszel estimator they analyzed 10 risk factors with the strongest four being pre-

existing dementia (*OR* 5.2), medical illness (*OR* 3.8), alcohol abuse (*OR* 3.3), and depression (*OR* 1.9). They determined that several risk factors appeared to be consistent in identifying patients at high-risk for developing delirium; however, these were not consistent with the research of Inouye and Charpentier (1996). This highlighted the difficulty of identifying specific risk factors to the development of delirium and encouraged further research that included an analysis of multiple types of delirium.

Compounding the difficulty of risk factor identification are patients who develop subsyndromal delirium. Ceriana, Fanfulla, Mazzacane, Santoro, and Nava (2010) conducted one of the few studies on patients admitted to a step-down unit and focused on subsyndromal delirium. The researchers analyzed 234 patients and found the incidence of 7.6% who developed delirium and 20% who developed subsyndromal delirium. They noted the presence of subsyndromal delirium was a significant risk factor for developing delirium on the step-down unit (*OR* 11.0; $p < 0.0001$). Researchers found that previous brain failure in the ICU prior to admission to the step-down unit was strongly associated with the development of subsyndromal delirium (*OR* 5.12; $p < 0.001$). The ICU has been the focus of most delirium studies; however, delirium can continue to be a factor once transferred out of the ICU. The researchers concluded that patients with subsyndromal delirium were difficult to recognize and required prompt treatment due to the risk of developing delirium. These patients presented with different risk factors than Inouye and Charpentier (1996) and Ellie et al. (1998). This again highlights the struggle to identify specific risk factors related to the development of both delirium and subsyndromal.

Mittal et al. (2011) conducted a comprehensive review, which referenced the earlier Inouye & Charpentier (1996) study, but focused specifically on how pharmacotherapy affected the development of delirium. The authors analyzed seven studies implicating antipsychotics, cholinesterase inhibitors, benzodiazepines, and other classifications of medications. They found more specifically that high-dose haloperidol was associated with significant side effects while low-dose haloperidol was safe and efficacious. Only one study that they analyzed focused on cholinesterase inhibitors, and that study showed that there was no evidence that donepezil was effective in contributing to or treating delirium. Each of the studies that analyzed benzodiazepines suggested their use was not recommended for patients experiencing delirium unless the patient was withdrawing from alcohol according the researchers. The authors concluded that early detection and connection of risk factors provided better management of delirium (Mittal et al., 2011). Prescribed medications added another layer to the difficulty in addressing specific risk factors associated with the development of delirium; however, tied in with Inouye and Charpentier results of greater than 3 medications being added in a 24 hour period predicting delirium.

Khan et al. (2012) did not focus specifically on pharmacological risk factors but compared multiple different populations when they conducted a systematic evidence review of delirium in hospitalized patients. Their purpose was to provide information for clinicians and identify gaps in the research. The researchers analyzed six systematic evidence reviews that included three surgical units, one ICU, and two combined MS units. Only one of the studies was included in the previously reviewed articles. The

authors did not identify statistical values but identified the following risk factors for vascular surgery patients: age greater than 64, previous cognitive impairment, depression, if the patient received a blood transfusion during surgery, and previous amputation. The researchers also suggested that Meperidine was associated with an increased risk of delirium in elderly surgical patients, a result not found by Mittal et al. (2011). Khan et al. concluded that even with current advances, the benefits of screening versus the cost was uncertain, but that the impact of delirium on patient and healthcare workers and organizations suggested conducting further research. Once again, the variety of potential risk factors leading to the development of delirium is considerable and adds to the difficulty in identifying specific risk factors.

Continuing to solidify the risk factor theme, the largest and most recent systematic review by Mattar, Chan, and Childs (2013) included 22 studies from 1990 to 2012; however, many were not the same as previous authors had examined. The researchers evaluated 614 medical ICU patients, 144 surgical ICU patients, and 112 cardiac ICU patients. This study, however, excluded MS patients. Results reported by the researchers indicated that the most significant risk factor for the development of delirium, regardless of the clinical setting, was the administration of benzodiazepines adding to the evidence presented by Mittal et al, (2011). Stepwise logistic regression analysis determined that hypoalbuminemia, which supported the researcher of Inouye and Charpentier (1996) and the presence of sepsis factors signaled the early development of delirium in medical ICU patients according to Mattar et al. Researchers found that risk factors associated with delirium development in surgical ICU patients included age,

dementia on admission, Glasgow Coma Scale (GCS) of 12 or less, blood transfusions, higher multiple organ failure scores, number of ventilator days, oxygen saturation, and pulse rate taken in the emergency department (ED). Cardiac ICU patients who were at risk for the development of delirium were older, had longer surgery times, prolonged intubation time, low intraoperative temperature, higher creatinine levels, longer on-pump time, and lower minimental status scores according to researchers. With each subsequent study, the list of risk factors related to the development of delirium increases while supporting specific aspects of previously published researcher.

Adding to the variety of potential risk factors for the development delirium is the potential risk associated with the development of subsyndromal delirium. Shim, DePalma Sands, and Leung (2015) proposed that the concept of subsyndromal delirium lacked understanding in terms of clinical significance and thus aimed to determine the prognostic significance in older surgical patients. Their sample included a prospective cohort of 631 patients 65 years of age and older who were scheduled for a noncardiac surgery and were assessed for post-operative delirium with the CAM. The authors defined subsyndromal delirium as the presence of at least one of 10 delirium symptoms but did not meet the criteria for delirium. Researchers found that when compared to patients with no subsyndromal symptoms, a patient with one subsyndromal symptom was 1.07 times more likely to have delirium on the next post-operative day (95% CI 0.42–2.53). Those with two subsyndromal symptoms were 3.32 times more likely to have delirium the next post-operative day (95% CI 1.42–7.5) and patients with more than two subsyndromal symptoms were 8.37 times more likely to have delirium the next post-

operative day (95% CI 4.98–14.53). Researchers stated that this led to an increased length of stay in the hospital and decreased functional status one month after surgery. Since the development of delirium may also be associated with the presence of subsyndromal delirium, its value as a risk factor is important to analyze. However, research related to subsyndromal delirium is limited.

In the single systematic review specifically focused on subsyndromal delirium, Cole, Ciampi, Balzile, and Dubuc-Sarrasin (2013) aimed to analyze frequency and risk factors. Their review included six studies dated between 1996 and 2012 including the Italian study by Ceriana et al. (2010) previously described. Risk factors included: (a) older age (*OR* 2.04; $p = 0.097$); (b) dementia (*OR* 2.23, $p = 0.006$); (c) admitted from an institution (*OR* 2.43, p = 0.205); (d) male (*OR* 1.10, $p = 0.313$); (e) severity of illness (OR 2.74, p = 0.057); (f) impaired basic activities of daily living (*OR* 1.91, $p = 0.099$); (g) vision impairment (*OR* 1.70, $p = 0.837$); (h) hearing impairment (*OR* 1.29, $p = 0.460$); (i) use of anticholinergic medications (*OR* 1.03, $p = 0.096$); and (j) use of benzodiazepines (*OR* 1.32, $p = 0.835$). The use of benzodiazepines as a risk factor was supported by Khan et al, 2012) and Mittal, et al. (2011). Cole et al. expressed concern with unexplained heterogeneity of the study, so they urged caution in interpreting results; however, risk factors for subsyndromal delirium were similar to those for other types of delirium.

Comparing the published research to the current project hospital, an analysis of 68 medical records of patients from a single hospital over one year and coded with a delirium diagnosis, a content analysis was conducted to determine similar characteristics of patients. Thirteen characteristics were identified that occurred in more than 75% of

the patients and included: (a) being male; (b) a high fall risk: (c) recent smoking history; (d) frequent use of alcohol: (e) at least 64 years of age; (f) single; (g) admitted through the emergency department; (h) currently using amphetamines; (i) benzodiazepines and anticoagulants; (j) admitted for or history of a respiratory or liver related illness, and (h) a do not resuscitate (DNR) status. The risk factors in the local population included some commonalities with the published studies previously reviewed, such as Khan et al. (2012) and Mittal et al. (2011), but also generated some unique risk factors (Paul, 2013).

It is clear that there are a significant number of potential risk factors identified across a wide variety of patient types and clinical settings. This lack of clarity indicates the need for organizations to identify risk factors that are specific to their patient population. Accurate identification of risk factors leading to the development of delirium along with the use of delirium detection tools will support early identification of patients experiencing delirium.

Background and Context

The organization benefiting from this quality improvement project is located in the Pacific Northwest. The medical center is not-for-profit, faith-based community hospital which provides both inpatient and outpatient services. Key services include surgery, cardiovascular, oncology, emergency, orthopedics, labor and delivery, imaging, and rehabilitation services. The project hospital is part of a larger corporation that comprises multiple hospitals, clinics, home care agencies, hospice agencies, and retirement centers. The project hospital maintains accreditation as a chest pain center, STEMI (ST segment elevated myocardial infarction) receiving center, and for cardiac

rehabilitation. They maintain national ranking in the top 5% for the *HealthGrades* clinical excellence category, and received an A, for hospital safety that includes protecting patients from accidents, errors, injuries, and infections. The organization maintains full accreditation by the Joint Commission, certification for the hip and knee replacement program, and advanced certification as a primary stroke center.

The mission of the organization is consistent with being a faith-based not-for-profit organization. The mission is the foundation for their vision to provide high-quality care to the whole-person. This culture provided a rich environment to implement delirium specific education, use of the CAM as part of a comprehensive delirium management plan, and enhance the success within an organization that prides itself in providing high-quality care to the whole person.

The project hospital did not have a comprehensive management plan for patients admitted to the MS unit with delirium. Recent administration guidelines encouraged the use of restraints as a solution to the high cost of sitters according to hospital administrators. However, current research has suggested that through the implementation of a comprehensive delirium management plan, hospitals have created effective solutions without the use of restraints or sitters (Flaherty & Little, 2011; Neufeld et al., 2011). This research prompted administration to reanalyze their use of restraints. There had also been current research, which suggested that sitters have been an effective part of a comprehensive delirium management plan (Carr, 2013). The hospital administration felt it was time for the development of guidelines to manage the care of patients experiencing delirium on the MS units.

A majority of the staff and administration know me well through prior employment at the organization. Currently, I am an associate professor of nursing at Walla Walla University (WWU). The organizations have an affiliation agreement allowing nursing students to complete clinical rotations at the medical center. An outside yet known person such as myself, with credibility and leadership skills, provided an avenue to share knowledge with the staff through this quality improvement project. The study organization will potentially benefit through decreasing costs associated with the delirium patient and supporting the ability of the staff to provide higher quality care. Improving the care given to vulnerable elders is in alignment with the mission, vision, and goals of the medical center and provides an opportunity improve care.

Summary

The literature reviewed underscored the need to provide quality delirium education to nurses, develop delirium assessment tools, and implement risk assessment tools specific to the MS population. Nurses were limited, due to lack of knowledge, in their ability to identify subsyndromal and hypoactive forms of delirium (Mistarz et al., 2011). The use of standardized delirium detection tools improved nurses' ability to detect delirium; however, most tools are designed for ICU patients and do not reliably detect delirium in the MS patient (Holly et al., 2013). Quality education, risk assessment, and delirium detection tools geared toward the MS patient and the organization's population may be more effective in detecting delirium. With this project, I began to fill the gap in the literature by advancing nursing knowledge regarding delirious patients and enhancing their ability of the nursing staff to detect delirium on the MS unit. The next

section will delineate the methodology used to administer the quality improvement project.

Section 3: Methodology

Introduction

This quality improvement project was the initial phase of the implementation of a comprehensive delirium management plan. In this phase, I focused on the ability of the medical floor nursing staff to implement the CAM and analyzed potential predictors of delirium within the local population as compared to those identified by Inouye and Charpentier (1996). This section will address the project design, methods, population, and sampling. The final portion of the section will include further details regarding data collection, data analysis, threats to validity, reliability, and consistency, along with instruments used and the project evaluation plan.

Project Design/Methods

The quality improvement project included two components. The first component of the quality improvement project involved measurement of nursing staff knowledge regarding delirium. Within this component, I administered a pretest/posttest survey to the nursing staff to measure knowledge gained. Additionally the postimplementation survey data administered at the end of data collection allowed for analysis of facilitators and barriers associated with the administration of the CAM. Results of this survey provided me with a basis to make changes, if necessary, before future all-hospital implementation of the CAM, which was beyond the scope of this quality improvement project. The second component identified whether the patients being assessed using the CAM

possessed any of the five independent risk factors for the development delirium, identified by Inouye and Charpentier (1996).

Population and Sampling

I included all nursing staff scheduled to work during the project period and who completed the educational intervention in the sample. These nurses administered the CAM and completed the demographic tracking checklist on all patients admitted to the medical unit at the study organization on admission and on each subsequent shift until discharge. Patients not legally adults and any patient admitted for less than an hour before transfer to another unit were excluded to focus exclusively on MS patients.

Data Collection

The organization's administrators approved the project and waived the need for informed consent since I did not carry out any experimental interventions. Health Insurance Portability and Accountability Act guidelines were followed at all times, as protected patient information was collected by identified by number only to avoid identification of specific patients. The specific measures I took to protect private patient information included obtaining permission to have access to personal health information and then de-identifying all the data used in the quality improvement project. I also obtained approval obtained from Walden University's Institutional Review Board confirming that the quality improvement project met ethical standards. The Walden IRB approval number assigned to the quality improvement project was 08-01-15-0350035. Nursing staff on the medical unit consented to participate by requesting to be the first unit to administer the CAM to patients as part of the routine assessment. Nurses had the

option to not attend the educational intervention and thus not be part of the quality improvement project.

Data Collection From Nursing Staff

Collection of the first set of data occurred prior to providing the educational intervention. In accordance with Rogers' theory (2003), the knowledge-gaining phase included a 90-minute multifaceted educational intervention to the medical floor nursing staff that covered delirium subtypes, risk factors, and use of the CAM. I provided the nursing staff with didactic information interspersed with video demonstrations, followed by case scenarios, and a live demonstration of CAM use. Staff were given time to process the multiple delirium types and relate stories of caring for patients with delirium from their current practice. Staff members, in pairs, demonstrated their understanding of CAM by administering it to four standardized patients, each experiencing a different type of delirium. Thoroughly coached local nursing students and instructors served as standardized patients. Nurses were able to obtain patient history and current laboratory values along with interviewing the patients. Research has demonstrated that providing the staff with an interactive patient and a realistic experience enhanced knowledge acquisition and retention (see Larsen, Butler, Lawson, & Roediger, 2012; Oh, Jeon, & Koh, 2015). Lastly, the nurses compared notes and experiences administering the CAMs with the group attending the educational intervention. Staff were allowed significant time to clarify understanding and ask questions. Available for each staff member was a notebook that included current delirium research studies, a copy of the CAM and directions for its use, a copy of the delirium risk factor collection tool, and information on

how to contact me. I placed an additional notebook with the same information at the nurse's desk on the medical unit along with a dry erase board that was updated at the beginning of each shift and highlighted the progress (number of enrolled patients) throughout the implementation of the quality improvement project.

I developed and administered a pretest at the beginning education intervention and then gave the participants the same test at the completion of the educational intervention to determine the change in knowledge level of the staff. Raw scores and overall percentages provided ratio level data. To maintain the consistency of the information taught, two identical education interventions accommodated the number of staff attending and the quality of the learning environment.

Data Collection From CAM Assessments

The desired benchmark I set was to complete administration of the CAM on 80% of the patients admitted to the medical unit during the project period. The frequency of CAM assessments was determined by measuring the difference between the expected number of assessments and the actual number of assessments performed by the nursing staff. This information provided additional ratio level data. The plan was to collect data, sort it into categories creating nominal level data, to analyze why there were missing assessments. However, there were no missing assessments. I measured the outcome of the CAM assessment, administered on admission and at the beginning of each subsequent shift, using nominal data. Either the patient developed delirium or they did not.

Risk Assessment Data Collection

I collected risk assessment data via the demographic tracking checklist in tandem with the CAM assessment. The nurses completed the demographic tracking checklist on more than 80% of the patients admitted to the medical unit during the study period, surpassing the desired benchmark. Use of urinary catheter and/or physical restraints were coded as, yes or no, and collected as nominal level data. Malnutrition data were collected through serum albumin levels providing ratio level data. Inouye and Charpentier (1996) reported Albumin level as grams per liter and levels in this project levels were reported in grams per deciliter, which are equivalent measures. Additionally, the number of different new medication types added was calculated providing ratio level data. Iatrogenic events were categorized into six major categories (cardiopulmonary complications, hospital-acquired infections, medication-related complications, complications of diagnostic or therapeutic procedures, unintentional injury, or other) and recorded as present or not present providing nominal level data.

Data Collection Methodology

Finally, I collected and recorded data on a Microsoft Excel spreadsheet and saved it on a password-protected flash drive. I anticipated that there could be missing data that could potentially result in bias. It was preplanned that missing values would be inputted using maximum likelihood strategies; however, there were no missing data.

I determined the patient sample size by the number of patients admitted during the project period. Typically, 10 patients per variable provide an appropriate sample size with the necessary statistical power to generate statistically significant results (Polit &

Beck, 2006), though some sources suggested that 20 provided more accurate results (Courvoisier, Combescure, Agoritsas, Gayet-Ageron, & Oerneger, 2011). Based on admission data, I estimated that a sample size of 150 patients would provide the minimum number of subjects for adequate study power at the 0.05 level.

Data Analysis

Knowledge Test

I evaluated pretest and posttest scores with a paired *t*-test score. This provided a comparison of the mean score on the pretest with the mean score on the posttest for the study participants. This determined if there was a statistically significant change in the baseline delirium knowledge of the nursing staff (see Polit & Beck, 2006).

CAM Frequency

I measured the number of completed CAMs against the number of expected CAMs to determine the overall percentage of completed CAMs compared to the proposed benchmark of 80%. The original plan was to collect the reasons for noncompletion and categorize them into themes; however, there were no missing or noncompleted CAMs. These themes would have provided important information to improve CAM completion rates in future projects.

CAM Administration

To assess interrater reliability, I randomly reassessed the benchmark goal of 20% of the patients with the CAM and risk factor assessment tool. My reassessment occurred within 30 minutes of the staff nurse assessment. The benchmark goal was 100% interrater reliability between the nursing staff and myself.

Risk Factor Analysis

I performed logistic regression analysis using the identified risk factors to determine if there was a relationship between the variables since the dependent variable was binary (see Huck, 2011). My focus was to determine if any of the independent variables formed a statistically significant relationship with the development of delirium. The independent variables included the previously mentioned risk factors studied by Inouye and Charpentier (1996) and the dichotomous dependent variable was whether the patient developed delirium. All data were analyzed via SPSS version 21.

Threats to Validity, Reliability, and Consistency

In conducting research, it is important to control for internal and external validity (Polit & Beck, 2006). To reduce threats to validity and provide consistency in this quality improvement project, a single presenter (myself) conducted the two educational interventions. Additionally, I conducted all spot checks on the nursing staff administration of the CAM.

Instruments

Pretest and Posttest

I developed a 15-question knowledge test based on the content of the educational intervention (see Appendix A). Thirteen questions were multiple choice and two questions were true/false. A score of zero indicated the nurse answered all the questions wrong and a score of 15 indicated the nurse answered all the questions correct. A group of nursing faculty who were experts in test question construction and clarity piloted the questions and I modified the test in response to their feedback.

Confusion Assessment Method

The CAM is a diagnostic algorithm based on four elements: (a) mental status that fluctuated and was acute in onset, (b) inattention, (c) disorganized thinking, and (d) altered level of consciousness (Inouye et al., 1990; see Appendix B). The diagnosis of delirium was determined when the patient exhibited both fluctuating mental status and attention and either disorganized thinking or altered level of consciousness (Inouye et al). In a systematic review of current usage, Wei et al. (2008) examined the psychometric properties and multiple uses of the CAM including adaptations and translations. They analyzed 209 articles including 10 validation studies, 16 adaptation studies, 12 translations studies, and an additional 222 that were application studies. After analyzing the validation studies, the researchers revealed that the sensitivity and specificity were over 94% and 89% respectively. Their analysis established the CAM as a significant tool that is appropriate to use in the identification of delirium.

Postimplementation Survey

The nurse participants voluntarily completed an implementation survey during the project period (see Appendix D). The survey consisted of six questions designed to determine the nurse's perceptions of the ease of administering the CAM. Data were obtained using a traditional Likert-scale and reported in means and standards deviations. One open-ended question provided the nurse the ability to give feedback on the process. Each Likert scale question also allowed room for the nurse to provide feedback.

Project Evaluation Plan

Evaluation is a process that occurs throughout the implementation of a project, not just as an end-point (Hodges & Videto, 2011). I incorporated various types of evaluation during project planning. Formative evaluations usually occur prior to implementation as part of a needs assessment to identify the purpose or need for making a change in the first place (Hodges & Videto). My formative evaluation identified that the nursing staff expressed concern regarding their lack of expertise in caring for elderly patients experiencing delirium. An informal needs assessment generated my beginning impetus to develop a comprehensive delirium management plan, which began with improving the knowledge of the staff directly caring for these vulnerable elders. Addressing the stakeholder's concerns and including them in the planning process creates a positive practice environment, improves nurse satisfaction, and contributes to quality patient care (Twigg & McCullough, 2013). The initial need for delirium education was addressed at the organizations' Fall Education Express 2013, where I presented an education module I developed for all staff via an interactive poster presentation. A minisummative evaluation occurred at the conclusion of the nursing education in-service. Staff completed a short survey indicating what they learned. Analysis of that survey provided me with information to improve implementation of the current quality improvement project.

Summative evaluation occurred after the project period on the medical unit. In this evaluation, I analyzed staff perceptions of the CAM administration on the medical unit and provided feedback that will be useful for implementation of the CAMs on other

units at the same organization. Impact and outcome evaluation will not occur until the comprehensive delirium management plan has been in place for a minimum of 3 months.

Summary

Delirium is of significant concern to patients, clinicians, and healthcare organizations. With prevalence rates climbing and increasing costs associated with caring for patients who develop delirium during hospitalization (Inouye et al., 2013), it was necessary to develop strategies to reduce delirium. A key component to the reduction of delirium was to provide delirium education to the nursing staff regarding identification of patients at risk for the development of delirium and the use of appropriate delirium detection tools to provide early identification and allow for the initiation of protocols designed to decrease the impact of delirium. Providing early CAM administration and assessment of potential risk factors allowed for quick identification of patients with delirium and promoted early mitigation of adverse events related to the development of delirium. With the methodological aspects of the quality improvement project defined, what follows is an indepth analysis of the findings.

Section 4: Findings, Discussion, and Implications

Introduction

Nurses at study organization, along with nurses across the country, expressed concern with their lack of knowledge regarding the identification and management of delirium in the MS patient experiencing delirium and more specifically, subsyndromal or hypoactive forms of delirium (Hall et al., 2012; Holly et al., 2013; Mistarz et al., 2011). There is a paucity of research regarding the identification and management of delirium in

the MS patient experiencing subsyndromal or hypoactive forms of delirium. The purpose of this quality improvement project was to implement the CAM screening tool on a medical unit by nursing staff, after receiving high quality delirium education, to identify patients experiencing delirium. Patients were additionally screened for five potential risk factors of delirium from the multifactorial model of delirium to determine if they accurately predicted delirium in the local population admitted to a single hospital (see Inouye & Charpentier, 1996).

The sources of evidence from the nursing staff included the pretest and posttest scores on the knowledge test and results of the postimplementation survey. The CAMs and demographic tracking checklist provided sources of evidence from the patients assessed by the nursing staff. My analytical strategies included the use of paired *t*-test scores to evaluate pre- and posttest scores to determine if there was a statistically significant change in the baseline delirium knowledge of the nursing staff. I then measured the number of completed CAMs against the number of expected CAMs and compared the result to the proposed 80% benchmark. I evaluated interrater reliability of the CAM administration by randomly assessing patients within 30 minutes of the staff nurse with a benchmark goal of 100% interrater reliability. A Likert Scale postimplementation survey provided data regarding nurse satisfaction with the educational intervention and the implementation process. The demographic tracking checklist, completed by the nurses, in tandem with the CAM assessment was the source for the risk assessment data. Logistic regression analysis determined any statistically significant relationships between the development of delirium and any of the independent

variables. The following sections present findings and implications, recommendations, strengths, limitations, and implications for social change.

Findings and Implications

Nursing Staff Demographics

Twenty-four of 29 available nursing staff attended one of two 90-minute delirium education sessions (see Table 1). The vast majority were female (n = 20) and worked more than 25 hours per week (n = 18). Half were between 30 and 39 years of age (n = 12), and most had less than 14 years of experience (n = 21). Most held a bachelor's degree in nursing (n = 16) and half held some type of specialty nursing certification (n = 12).

Table 1

Demographics of Survey Participants

Variable	*n*	%
Age		
18–29	2	8.3
30–39	12	50
40–49	6	25
50–59	2	8.3
60–69	2	8.3
Gender		
Male	1	4.2
Female	23	95.8
Years practiced in this role		
< 1 year	0	0
1–4 years	5	20.8
5–9 years	8	33.3
10–14 years	8	33.3
15–19 years	1	4.2
20–24 years	1	4.2
25–29 years	1	4.2
30–34 years	0	0
35–39 years	0	0
> 39 years	0	0
Weekly scheduled work hours		
0–12 hours	2	8.3
13–24 hours	4	16.7
25–36 hours	13	54.2
> 36 hours	5	20.8
Highest attained nursing degree		
Associate's degree	8	33.3
Bachelor's degree	16	66.7
Master's degree	0	0
Doctoral degree	0	0
Specialty Nursing Certification		
Yes	11	45.8
No	13	54.2

Note. $N = 24$.

Nursing Knowledge Scores

Overall mean scores improved significantly from pretest to posttest: 6.83 (±1.7) vs 10.33 (±1.09); $t(23) = -8.06$, $p = 0.000$. I conducted analysis of pretest and posttest scores on individual questions using the McNemar test (see Table 2; see Polit & Beck, 2006). The difference between pretest and posttest score for four individual questions

reached statistical significance ($p = 0.000$). My analysis of change in knowledge was indeterminate for six questions because all the nurses scored the same on either the pretest or posttest, or in one instance, everyone scored correctly on the pretest and the posttest except the same two nurses incorrectly answered a question on both the pre- and the posttest. There were no significant correlations between overall pretest and posttest scores and demographic data. The educational intervention provided an appropriate means for knowledge acquisition regarding delirium and the administration of the CAM.

Table 2

Nursing Knowledge Scores

Test Questions	McNemar Test Exact Significance (2-sided)
Question 1: Current healthcare costs related to delirium in the US total _____ a year.	$p < 0.000$
Question 2: Nationally the percentage of hospitalized patients diagnosed with delirium is estimated at _____?	$p < 0.012$
Question 3: In the local population at this hospital, the percentage is hospitalized patients diagnosed with delirium is estimated at _____.	$p < 0.000$
Question 4: The average length of stay for a patient diagnosed with delirium at this hospital is?	*
Question 5: Delirium can be characterized as:	*
Question 6: Sarah Gentry is restless, trying to crawl in and out of bed, she fluctuates between crying and laughing and is very concerned that her dog get let out. Which type of delirium does her current behavior represent?	$p < 0.000$
Question 7: Mark Lazone is restless, trying to crawl in and out of bed, fluctuates between angry outbursts and a calm demeanor, but listens carefully as you speak to him. Which type of delirium does his current behavior represent?	*
Question 8: Which type of delirium is most commonly found on medical/surgical units?	*
Question 9: Delirium is typically caused by one single precipitating factor in the hospitalized patient.	*
Question 10: Reducing the prevalence of delirium, through early identification, may lead to:	*
Question 11: The five independent risk factors used to predict delirium by Inouye & Charpentier are:	$p < 0.267$
Question 12: Which situation best describes some of the risk factors found in patients at this hospital?	$p < 0.219$
Question 13: Research shows that nurses are well equipped to identify patients experiencing delirium.	$p < 0.375$
Question 14: The CAM feature one demonstrates:	$p < 0.344$
Question 15: Which of the following scenarios demonstrates delirium according to the CAM.	$p < 0.227$

*Unable to establish significance due to lack of variability in the pattern of answers.

Nursing Staff Implementation of the CAM

Between September 15, 2015 and November 2, 2015, staff administered 1,057 CAM assessments to 208 consecutive patients. Four patients were not administered CAMs because they did not meet inclusion criteria and their data were not included in the analysis. One hundred percent of all the eligible adult patients admitted during the study period were administered the CAM, exceeding my desired 80% benchmark. An average of 4.96 (± 3.64) CAMs were completed per patient with a range of 1–20. The nursing staff and I administered 225 CAMs with interrater reliability of 100%.

Post-implementation Survey

Following the completion of the project period, nursing staff participants anonymously completed the postimplementation survey (See Table 3). The majority of their answers were on the positive end of the Likert scale (1 = *strongly agree*, 2 = *agree*, 3 = *disagree*, 4 = *strongly disagree*), although one nurse did not feel supported by hospital management during the data collection period. The nursing staff expressed confidence in their education regarding administration of the CAM and felt they had resources (poster and training manual) available to them if they had questions. They expressed that they knew who to go to for additional questions and felt supported by me and hospital management during the project period. The nursing staff felt confident in their ability to administer the CAM and that integrating the CAM into their daily routine could potentially improve patient outcomes. When asked if they had any suggestions for easier implementation they responded that it would be helpful to have the CAM as part of the computerized charting system in order to start using it on all patients hospital-wide.

Table 3

Post-Implementation Survey Results

Question	Mean Score (n = 6)
Question 1: I feel confident in my ability to successfully use the CAM.	1.67
Question 2: If I had a question regarding administration of the CAM, I would know who to go to for support.	1.33
Question 3: The training manual provided helpful easy to access information regarding administration of the CAM.	1.33
Question 4: I feel that incorporating the CAM into the daily assessment routine could improve patient outcomes.	1.5
Questions 5: I felt supported by the researcher during the project period.	1.17
Question 6: I felt supported by hospital management during the project period.	2

Patient Demographics

The mean age of the 208 patients was 63.8 years (±18.45) with a range of 17–98 years of age (see Table 4). Fifty-three patients (25%) were admitted on an observation status, meaning it was the expectation that the patient would require hospital care for less than 24 hours. One hundred and fifty-five (75%) patients were admitted to the hospital with full inpatient status. There were no statistically significant differences in patient demographics between patients admitted on observation status and those admitted on full inpatient status. Therefore, I collapsed admission data into a single group.

Benzodiazepines were taken by 49 patients prior to admission or prescribed during hospitalization, 12 admitted to amphetamine use (either by prescription or illicit use), and 119 were on anticoagulants (see Table 4). The high number of patients on

anticoagulants was not a surprise considering that the medical unit admits all the MS stroke patients. The 208 patients on the medical unit had 418 unique admission diagnoses. As expected, because it was a stroke and medical overflow unit, the highest percentage of patients had neurological diagnoses. However, no patients received an admission diagnosis of delirium per the physician's records.

Based on nurse administration of the CAM, 52 patients were either admitted or developed subsyndromal or full delirium during their hospitalization. At admission, 12 patients were identified as having subsyndromal delirium and 27 had delirium based on administration of the CAM. During the course of hospitalization, four patients developed subsyndromal delirium and eight patients developed delirium. One patient fluctuated between subsyndromal delirium and full delirium. Due to the small number of patients, I collapsed subsyndromal and delirium status into two summative categories: those who did not experience subsyndromal or full delirium versus those who did experience subsyndromal or full delirium. These data were used to categorize the correlation data.

Table 4

Patient Demographics

Variable	n	%
Age		
17 – 29	14	6.9
30 – 39	11	5.5
40 – 49	19	8.60
50 – 59	32	15.3
60 – 69	50	24
70 – 79	38	18.3
80 – 89	32	15.5
90 – 99	12	5.8
Gender		n = 208
Male	95	45.7
Female	113	54.3
Companion Status		n = 208
Lives alone	120	57.7
Lives with family	88	42.3
Smoking Status		n = 208
Current smoker	72	34.6
Non-smoker	136	65.4
Alcohol Consumption		n = 208
Currently consumes	69	33.2
Non-drinker	139	66.8
Benzodiazepine Use		n = 208
Currently taking	49	23.6
None use	159	76.4
Methamphetamine Use		n = 208
Currently taking	12	5.8
None use	196	94.2
Anticoagulant Use		n = 208
Currently taking	119	57.2
None use	89	42.8
Admission Status		n = 208
Observation	53	25.5
Full admission	155	74.5
Admission Shift		n = 208
Day shift	95	45.7
Night shift	113	54.3
Admission Diagnosis*		n = 208
Neurological	117	28
Respiratory	52	12
Hematology and Fluids/Electrolytes	47	11
Gastrointestinal	46	11
Cardiovascular	37	9
Renal	32	8
Endocrine	21	5
Psychosocial	19	5
Integumentary	18	4
Infectious/Immune	18	4
Metabolic	7	2
Musculoskeletal	5	1

Note. $N = 208$.

*numbers add to more than 100% because most patients had more than one admission diagnosis

Five Predictors

To reiterate, the five independent precipitating factors from Inouye and Charpentier (1996) that are included in the model for predicting the development of delirium are greater than three medications added in a 24-hour period, an iatrogenic event during the patient's hospitalization, malnutrition based on the patient's albumin level, the use of physical restraints, and the use of a urinary catheter. These five predictors were analyzed for statistically significant associations and correlation in the local population. Three initially revealed statistically significant correlations.

Greater Than Three or More Medications in a 24-Hour Period

Overall, 93 patients were administered three or more new medications within a 24-hour period during any point within their hospitalization. Pearson's chi-square test revealed a statistically significant association ($p < 0.032$) between receiving three or more new medications within a 24-hour period and delirium status. Pearson's correlation showed a statistically significant correlation ($r = -0.149$; $p < 0.033$) between being administered three or more new medications within a 24-hour period during any point within their hospitalization and delirium status.

Iatrogenic Events

Overall, 13 patients experienced an iatrogenic event during their hospital stay. Pearson's chi-square test revealed a statistically significant association ($p < 0.002$) between the occurrence of an iatrogenic event and delirium status. Pearson's correlation showed a statistically significant correlation ($r = -0.218$; $p < 0.002$) between iatrogenic

events and delirium status. Table 5 provides a summary of the types of iatrogenic events that occurred.

Malnutrition

Overall, 34 patients had an albumin level less than or equal to ≤ 3 g/dL, 151 had normal levels and 23 patients did not have a level drawn during the course of their hospital stay. Pearson's chi-square test revealed no statistically significant association between low albumin level and delirium status ($p < 0.158$). In addition, Pearson's correlation showed no statistically significant correlation ($r < -0.095$; $p < 0.2$) between low albumin level and delirium status.

Restraints

Overall, six patients had either soft or leather restraints applied at admission or during their hospital stay. Pearson's chi-square test revealed no statistical relationship ($p < 0.632$) between restraint use and delirium status. In addition, Pearson's correlation showed no statistically significant correlation ($r = 0.033$; $p < 0.634$) between being restrained and delirium status.

Urinary Catheter

Overall, 21 patients had a urinary catheter placed at admission or during their hospital stay. Pearson's chi-square test revealed a statistically significant association ($p < 0.012$) between catheterization and delirium status. In addition, Pearson's correlation showed a statistically significant correlation ($r = -0.175$; $p < 0.05$) between having a urinary catheter and delirium status.

Table 5

Iatrogenic Events

Iatrogenic Events	
Event 1	Post-surgical cranial bleeding
Event 2	Transferred to ICU
Event 3	Unexplained seizure
Event 4	Unexpectedly expired
Event 5	Blood pressure dropped – transferred to ICU
Event 6	Acute stroke – transferred to ICU
Event 7	Catastrophic stroke – changed to DNR status
Event 8	Transferred to ICU
Event 9	Transferred to ICU
Event 10	Transferred to ICU
Event 11	Hallucinations – alcoholic detox
Event 12	Unable to urinate – retention catheter inserted
Event 13	Acute GI Bleed – transferred to ICU

Logistic Regression Analysis

Binary logistic regression was chosen because the dependent variable was dichotomous (delirium or no delirium; see Polit & Beck, 2006). The null model, assumed equal probability and indicated that the majority of the patients 73.4% (n = 161) would not be admitted with or develop subsyndromal or full delirium. The corresponding Wald statistic of 36.925 ($p < 0.000$) and Exp(B) of 0.363 confirmed in the null model that the difference between 135 (those who did not have or develop subsyndromal or full delirium) and 49 (those who did have or develop subsyndromal or full delirium) was statistically significant and predicted a 36% chance of a patient having or developing subsyndromal or full delirium. Initial results of the Omnibus Tests of Model Coefficients indicated with a chi-square of 16.496 (df 5; $p < 0.006$) that there was some degree of statistical significance that occurred in the model. The predictive capacity of the model was determined using Nagelkerke R Square statistic, which suggested that 12.5% of the

variability was related to the reason for developing delirium. To determine that the model was reliable it was necessary to demonstrate that the data did not conflict with assumptions made by the model. The results of the Hosmer and Lemeshow Test confirmed there were no conflicts. Within this test, non-significant results indicated that the model was predictive as was the case in this project (chi-square 3.619, *df* 4, $p <$ 0.460). The contingency table for the Hosmer and Lemeshow test showed very similar observed versus expected results. The larger the differences between observed and expected cases, the less predictive the model (see Table 6). In this project, the differences between expected and observed cases were minimal, indicating a more predictive model.

Table 6

Contingency Table for Hosmer and Lemeshow Test

	No delirium		Yes delirium		
	Observed	Expected	Observed	Expected	Total
Step 1	3	3.493	1	0.507	4
Step 2	70	65.916	10	14.084	80
Step 3	8	9.567	4	2.433	12
Step 4	36	36.830	15	14.170	51
Step 5	11	12.085	7	5.915	18
Step 6	7	7.109	12	11.891	19

The classification table that included the predictor variables and the accuracy of the predictor model demonstrated an increase in predictive value of the model from 73.4% to 76.1%. The model predicted that 37 of 49 patients would have or develop delirium or subsyndromal delirium. In reality, 52 patients had or developed delirium or subsyndromal delirium. Finally, in analyzing the specific variables in the equation, only

having a urinary catheter ($p < 0.48$) or an iatrogenic event ($p < 0.002$) predicted delirium in the local population (see Table 7).

Table 7

Variables in the Equation

Variables in the Equation						
	B	*S.E.*	Wald	*df*	Sig	Exp(B)
Urinary Catheter	-1.077	0.545	3.903	1	0.048	0.341
Iatrogenic Event	-1.689	0.735	5.282	1	0.022	0.185
Restraints	0.712	1.143	0.388	1	0.533	2.038
3 or more medications added	-0.588	0.359	2.682	1	0.101	0.555
Albumin level less than 3	-0.119	0.446	0.071	1	0.789	0.888
Constant	3.978	2.816	1.996	1	0.158	53.432

The findings in the logistic regression model were mostly consistent with the Pearson Correlations. Patient having a urinary catheter and an iatrogenic event during hospitalization contributed to the logistic regression model. Three or more medications in a 24-hour period no longer contributed unique explanatory value.

Additional Analysis

Pearson Chi-Square associations between delirium and additional patient demographics were conducted. Gender, admission status, smoking status, alcohol consumption, age, companion status, admission time, and amphetamine use did not have statistically significant associations. However, Benzodiazepine use prior to admission or prescribed after admission did have a statistically significant association with the development of delirium ($X^2 = 8.55$, $p < 0.003$).in

Unanticipated Outcomes

I did not anticipate 100% of eligible consecutive patients would be administered the CAM. It was anticipated prior to the start of the project that not all nurses would participate in the education intervention and thus would in not participate in data collection. The assumption was made that some patients would not have the CAM administered and their data would then be unavailable for analysis. However, 83% of the nurses participated in the educational intervention, allowing for adequate coverage of all project patients.

The second unanticipated outcome was the quantity of subsyndromal delirium identified. In this study, 17 (8%) patients had or developed subsyndromal delirium. Based on the literature this should not be surprising as MS patients often experience (20%) subsyndromal delirium (Ceriana et al., 2010) and it is underrecognized in this population (Cole et al., 2013; Khan et al., 2012).

Implications Resulting From the Findings

The purposes were to provide high quality delirium education to the nursing staff focused on the use of the CAM to identify patients experiencing delirium and determine if the five precipitating factors for delirium development identified by Inouye and Charpentier (1996) were present in the MS patients at the study organization. Based on the results of this project, the staff successfully administered the CAM screening tool. Using the CAM screening tool they identified patients who, based on previous practice, would not have been identified as having subsyndromal delirium or delirium (Paul, 2013).

Implementation of the CAM

The first project question was to determine if, based on highly quality delirium education, the medical floor nursing staff could successfully integrate the use of the CAM into the daily assessment plan of medical floor patients. Results from this quality improvement project indicated that following the educational intervention and implementation of the CAM delirium detection tool, nurses recognized delirium 100% of the time, which represented 25% of the MS unit population during the project period. Significant knowledge acquisition through a highly effective educational intervention along with a significant desire on the part of the nursing staff to improve their knowledge of delirium contributed to the early recognition of delirium. Participation in the project was voluntary, however, 24 of 29 staff members chose to be involved. Of the five staff members not involved two were on vacation, one was on maternity leave, one was transferring to another department, and one was moving to take a job in another state. Multiple research studies suggested that delirium is difficult to ascertain on nursing assessment alone. Mistarz et al. (2011) found that nurses only recognized delirium in their patients 27% of the time. In a study conducted by Rice et al. (2011), nurses identified delirium in only three of 12 patients based on nursing assessment alone. The nurses in the study conducted by Flagg et al. (2010) came closest to the results of this project by identifying patients with hyperactive delirium 90% of the time and 77% of the time when the patient presented with hypoactive symptoms. Prior to the implementation of this quality improvement project, delirium hospital-wide at the project hospital, was recognized in less than 1% of the total population (Paul, 2013), which was inconsistent

with published studies, which suggested that delirium is present in 29 – 64% of elderly patients on MS units alone (Carr, 2013; Inouye et al., 2013). Clearly, education and the use of a delirium detection tool is the preferred method for identifying delirium.

The majority of previous research studies identified that the CAM is the superior delirium detection tool. However, many also suggest that without appropriate education administration of the CAM by nursing staff is difficult. Holly et al. (2013) established that the CAM and CAM-ICU maintained the highest sensitivity and specificity scores when compared to the NU-DESC and NEECHAM delirium detection tools. The researchers suggested that sensitivity scores would improve if nurses received effective training prior to implementation. Grover and Kate (2012) concurred that the CAM was the superior diagnostic tool but that validity of the CAM was lower when administered by nurses and suggested improved training. Shi et al. (2013) compared the CAM and the CAM-ICU to the *DSM-IV* by evaluating diagnostic accuracy in 22 different studies. The researchers also concluded that adequate training was required to nursing administration of the CAM or CAM-ICU. Schuurmans et al. (2003) suggested that to improve the consistency of CAM use, staff must receive thorough training. This concept of thorough training was the foundation for planning the education intervention for this quality improvement project.

Additional factors that lead to the successful implementation of the quality improvement project included daily support for the project demonstrated by the unit administration. Administrators frequently rounded on the units and clearly showed their interest in the project, which empowered the nurses to share their experiences, and

motivated the staff. This support allowed for successful implementation of the CAMs into daily practice. The researcher spent significant time on both shifts supporting the nursing staff with daily encouragement, answering questions, and providing motivation. This combination of practices generated total buy-in by the staff for the project. Staff exceeded the 80% benchmark and administered the CAM to 100% of eligible patients. Second, there was 100% interrelator reliability between staff and I related to the results of the administered CAMs. Finally, the staff collected the data without any missing data. This quality improvement project clearly demonstrated that properly educated nursing staff could administer CAMs and successfully identify patients with delirium. This fact was highly important within this project as not one single patient admitted to the project unit received an initial diagnosis of delirium from a physician. One study by Neufeld et al. (2014) was consistent with this finding and indicated that physicians struggled with diagnosing delirium and the use of screening tools. If the physicians are missing the diagnosis or identifying delirious patient under a different diagnosis code, it is imperative that the nurses identify patients with delirium to mitigate the consequences associated with the development of delirium.

Risk Assessment Data Evaluation

The second project question was to determine if any of the independent predictors identified by Inoyue and Charpentier (1996) presented in the local population. The findings in this quality improvement project supported Inouye and Charpentier indicating that patients with a urinary catheter and those who experienced iatrogenic events were associated with delirium development. This project did not find that the use of restraints,

adding three or more medications in a 24-hour period, and albumin levels ≤ 3g/dL were associated with the development of delirium, as did Inouye and Charpentier. This may be because the hospital had initiated a project in 2014, prior to this quality improvement project, to reduce the use of restraints so there were simply not a significant number of patients in restraints. In terms of adding medications to a patient's regime on admission or during hospitalization the number of medications were not associated with the development of delirium; however, benzodiazepines were associated with the development of delirium. Albumin levels were not routinely drawn specifically for this quality improvement project as that was not the focus of this project. Future researchers may want to include routine albumin draws in their methodology as the Matter et al. (2013) study did indicate hypoalbuminemia as a risk factor in the development of delirium.

Elie et al. (1998) conducted a systematic review of risk factors noting that the strongest four risk factors were pre-existing dementia, medical illness, alcohol abuse and depression. I did not analyze relationships between pre-existing dementia, medical illness, and depression. Alcohol abuse was measured but showed a non-significant association ($X^2 = 1.22$, $p < 0.27$). Ceriana et al. (2010) conducted one of the few studies on patients admitted to a MS unit that focused on subsyndromal delirium. While researchers from the Ceriana et al. study found an incidence rate (20%) slightly higher than the one found in this quality improvement project (8%), the strongest association was previous brain failure in the ICU prior to admission to the MS unit. No patients with brain failure were analyzed in this quality improvement project. Mittal et al. (2011)

conducted a comprehensive review that focused on pharmacotherapy influences on the development of delirium. Their study results found that benzodiazepines were not recommended for use in patient experiencing delirium. These results were consistent with the results of this project suggesting benzodiazepines were a precipitating factor in the development of delirium. Khan et al. (2012) conducted a systematic review of both ICU and MS units. Within their study risk factors for vascular surgery patients included: greater than 64 years of age, previous cognitive impairment, depression, blood transfusion during surgery, previous amputation, and the administration of meperidine. This quality improvement saw no association between age ($X^2 = 72.72$, $p < 0.30$) and the development of delirium. In a study excluding MS patients, Mattar et al. (2013) also included age, dementia on admission, GCS of less than 12, blood transfusions, higher multiple organ failure scores, number of ventilator days, oxygen saturation, and the pulse rate taken in the ED. This quality improvement project did not track these risk factors other than age for which there was no association with the development of delirium. Shim et al. (2015) focused on the transition of subsyndromal delirium to delirium in patients 65 and older scheduled for a non-cardiac surgery. Researchers determined that the more subsyndromal symptoms a patient had the more likely they were to develop delirium. While this quality improvement project did not analyze subsyndromal symptoms, anecdotally, several patients moved along the continuum between subsyndromal delirium and delirium. In the single systematic review, focusing on subsyndromal delirium Cole et al. (2013) noted that risk factors were older age, dementia, admitted from an institution, male gender, severity of illness, impaired activities of daily

living, vision and hearing impairments, use of anticholinergic medications, and benzodiazepines. Specific demographics analyzed in this quality improvement project were age, male gender, and benzodiazepine use. Of these, age and benzodiazepine use were previously discussed. This project did not show male gender ($X^2 = 1.09$, $p < 0.30$) to be associated with the development of delirium.

What is clear with these finding is that identification of risk factors are often population dependent. While there were some similarities within the studies in terms of risk factors there were far more differences. What this indicates is that MS nurses need to be aware that risk factors are present in the majority of their patients and that all patients (not just elderly patients) should be assessed further for the development of delirium. This means that nurses need extensive education on recognizing delirium through assessment and the use of delirium detection tools in order to provide effective care for their MS patients. Knowing risk factors is not enough; however, through solid education delirium can be successfully identified by the MS nurse and thus mitigate subsequent consequences.

Additional Findings

This quality improvement project found that patients taking benzodiazepines predicted the development of delirium. This finding was consistent with Cole et al. (2013) in their analysis of risk factors associated with benzodiazepines and subsyndromal delirium. This finding was also consistent with Mittal et al. (2012) who recommended against the use of benzodiazepines for patients experiencing delirium unless the patient was actively experiencing alcohol withdrawal.

Unanticipated Outcomes

A strong educational intervention, combined with nurses committed to delirium education led to 100% of eligible consecutive patients being administered the CAM. All patients, with the exception of four who did not meet eligibility requirements, were included in this project. This commitment represented strong buy-in from nurses who were invested in the outcome of this quality improvement project. Eighty-three percent of the nurses participated in the project indicating successful transition through the diffusion of innovations attributes from knowledge practice to persuasion of attitude, commitment to the decision-making process, and implementation of the innovation (Rogers, 2003). Specifically during the persuasion process, the staff placed importance on the perceived attributes including the relative advantage of using the innovation, the compatibility with their core values, perceived simplicity of the innovation, trialability, and observability of the results.

This quality improvement project clearly demonstrated that with a strong educational intervention nurses are readily able to identify patients experiencing subsyndromal delirium and delirium. With underreported prevalence rates of subsyndromal delirium on MS units it is key that nurses be provided delirium education (Cole et al., 2013; Khan et al., 2012; Ceriana et al., 2010; Elie et al., 1998). This underrecognition of subsyndromal delirium negatively influences the care and treatment given to patients on a daily basis and contributes to subsequent poor patient outcomes. This results in increased length of stay, increased falls, contribute to cognitive and functional decline, increased 30-day readmission status, promotes institutionalization,

and increased mortality (Cole et al., 2013; Harlein et al., 2010; van den Boogaard et al., 2012; Witlox, et al., 2010). Risk factors that focus the attention towards elderly clients as being a significant risk factor also contributes to the underrecognition of subsyndromal delirium. If nurses spend time focusing on those patients who are over the age of 64 and do not recognize that patients of all ages are at risk for the development of delirium a significant portion of the population will not receive effective care for their diagnosis. Clearly, strong delirium education and the use of delirium detection tools are recommended for use on all MS units.

Implications for Positive Social Change

Older adults are at an increased risk for the development of delirium when hospitalized (U.S. Department of Health and Human Services, 2010). However, this project found that age was not associated with the development of delirium and that it occurred across the age continuum. Implementing solid delirium education for MS nurses and an assessment tool such as the CAM used in this quality improvement project led to earlier recognition of all types of delirium in all ages of patients. Further development of this project could potentially prevent patients of all ages from experiencing delirium through earlier identification and implementation of delirium specific treatment. This would lead to improved patient outcomes.

Recommendations

Since the nurses were successful at implementing the CAM and identifying patients experiencing subsyndromal and full delirium, the local recommendations are to identify a delirium champion from within the organization who will move to facility-wide

implementation of the CAM that includes the incorporation of the CAM into the electronic charting. However, the recommendations are not limited to the local population and is clearly essential that if hospitals want to implement delirium assessments as part of the daily nursing routine that a strong education intervention needs to be developed. Future research needs to replicate the educational intervention provided in this quality improvement project to determine if the same educational intervention promotes successful implementation of the CAM by other nursing staff populations. A final reason for continued research into early identification of delirium, is that, in my opinion, delirium is on track to be considered a hospital-acquired condition (HAC). The HAC Reduction Program provides monetary incentive for hospitals to reduce HACs in Section 3008 of the Patient Protection and Affordable Care Act (ACA; Centers for Medicare & Medicaid Services [CMS], n.d.). Hospitals that are proactive in identifying and treating patients with delirium will be prepared if this occurs.

Strengths and Limitations of the Project

Strengths

This project demonstrated a variety of strengths. Strengths related to the nursing staff included a strong education component and significant nurse buy-in. Methodological strengths included the fact that 100% of patients were administered the CAM, 100% interrelator reliability was achieved, no missing data were identified, and consecutive sampling was used to enroll patients in the project.

The most significant strength of the project was the strong educational intervention. The literature review demonstrated that nurse administration of the CAM

yielded over lower sensitivity scores (Agar et al., 2011; Flagg et al., 2010; Mistarz, et al., 2011; Rice et al., 2011). This coupled with the significant underrecognition of the delirium on the MS units lead to the development of a multifaceted nursing educational intervention that equipped nurses with the skills and confidence necessary to integrate the CAM into their daily assessment of patients. Recognition by the JC as a certified stroke unit evidenced that the staff on this unit was already equipped with strong assessment skills. Any hospital wishing to integrate nursing assessment of delirium into nursing practice, using the CAM would benefit from the development of a strong education program such as the one developed for this quality improvement project.

The second significant strength to the success of this project was the recognition of the nurses themselves that they lacked delirium knowledge but had a desire to change practice for patients with delirium. Nurses demonstrated buy-in and ownership of the project leading to high quality outcomes. Because of the strong work ethic of the nurses, 100% of patients who were eligible, were administered the CAM. Had the nurses not taken ownership of the project they could have sabotaged the process at multiple points. However, the nurses demonstrated a high level of teamwork and worked together to accomplish nursing tasks so that each nurse could fully commit to administering CAMs at the beginning of each shift.

A strong educational intervention also led to 100% interrelator reliability regarding the administration of the CAM between the staff and myself. Working together as a solid team allowed for uninterrupted time for each nurse to complete the CAM. This

teamwork coupled with confidence in their educational preparation led to high interrelator reliability.

Additionally, strong nurse buy-in led to ownership of the project and resulted in the nurses carefully documenting information on the demographic tracking checklist so that missing data was eliminated. Nurses carefully checked each demographic tracking checklist prior to the end of each shift to make sure that information was complete and accurate. This lead to high quality outcomes and accurate results.

The last advantage was that of consecutive sampling. This type of sampling is easier to gather and more likely to be representative of the population because the majority of the patients were included in the study (Terry, 2012). As mentioned previously only four patients not meeting inclusion criteria were not included in the study.

The local recommendations were twofold. First, was to identify a delirium champion from within the organization to promote the next phase of the process. Secondly, to continue with the integration of the CAM assessment hospital-wide within project hospital. The overarching recommendation is that hospitals wanting to begin assessing delirium on MS units provide a strong multifaceted educational intervention that teaches nurses to recognize delirium in all populations through administration of the CAM delirium detection tool.

Limitations

Some limitations to the methodology of this quality improvement project did exist. These limitations included implementation on one unit, at one hospital. Additional

limitations included a small sample size and the lack of physician's evaluation confirming delirium.

Limiting the quality improvement project to one unit did not provide the opportunity for the comparison of the educational intervention on two groups of nurses in terms of comparing knowledge acquisition and decreased the generalizability of the results to a larger population of nurses. Limiting the project to one hospital did not provide the opportunity for comparison of community versus university based hospitals in terms of staff education and patient populations. The small sample size, though appropriate for the number of variables and providing adequate power could have potentially shown more statistically significant associations with more subjects.

A second potential limitation was the lack of physician corroboration with the CAM assessment of delirium. A number of studies suggested that the diagnosis of delirium required confirmation by a physician expert in the field of delirium (Neufeld et al., 2011: Radtke et al., 2010; Shi et al., 2013). In this project, physicians did not recognize or document delirium on admission and potentially physician may need more delirium education. Future research might be to include physicians in the delirium educational intervention provided for the nurses.

Section 5: Scholarly Product and Analysis of Self

Scholarly Product

Zaccagnini and White (2011) described multiple purposes for dissemination of project results; however, the most fitting in the circumstance of this project was to share the results with the stakeholders. The nurse participants involved in this quality

improvement project were key stakeholders and took pride in the fact that they were the first unit at this hospital to participate in the change process prior to facility-wide implementation. Thus, in consultation with the hospital administration, dissemination of the results occurred first at their quarterly staff meeting. Second, the administration at the project hospital were also primary stakeholders in this project. The first presentation to administrative staff occurred during the monthly Patient Care Director's Council. The last presentation to administrative staff during a monthly Operations Council meeting will occur in the fall when they meet at the local organization. Since this project was only the first phase of a much larger delirium project, there will continue to be many opportunities to disseminate the results to a wider community of healthcare professionals.

Analysis of Self

Graduates of DNP programs practice in environments that are complex with multiple levels of organization (Zaccagnini & White, 2011). In these critical situations, it is important for nurses to develop the skills and knowledge to define potential barriers to optimal patient outcomes and develop interventions that promote efficient and safe delivery of care. This view is consistent with, *The Essentials of Doctoral Education for Advanced Practice Nursing* (American Association of Colleges of Nursing [AACN], 2006), which suggests that DNP students be involved in practice application-oriented projects that influence healthcare outcomes. Within this project, I have had the opportunity to practice in the role of practitioner, scholar, and project manager to design and implement a quality improvement project at the organization that has the potential to

positively affect patient outcomes and allow the nurses to provide care that is more effective.

Practitioner

As a professor in a school of nursing, I was able, through this project, to receive mentoring through the actual process of improving quality outcomes from a systems approach as opposed to teaching about providing quality care at the bedside to my nursing students. While I teach my students the importance of being consumers of evidence-based practice, in the role of practitioner I generated evidence-based practice through a quality improvement project that will change practice at this hospital. I learned the importance of teamwork to identify barriers to providing optimal patient care, select appropriate interventions to remove barriers, and evaluate the outcomes of the initiated changes (see Kelly, 2011). This correlated well with AACN (2006) DNP Essential II that promotes developing and evaluating the delivery of care in a way that meets the needs of the patient population. Patients who experienced delirium at the project hospital were underrecognized. By not recognizing that the patients had developed delirium, the nursing staff could not provide the appropriate patient-centered care to these individuals. Their length of stay was longer and they accessed more ancillary department services. Developing an efficient way to identify patients with delirium will allow for the implementation of interventions to improve patient outcomes and shorten length of stay. This process brings me full circle, as now I can share my experience with my nursing students, encourage them to identify barriers to positive patient outcomes, and seek to be part of the change process.

Scholar

The DNP Essentials III describes scholarship as the foundation of doctoral education programs (AACN, 2006). Particularly, in DNP programs, the translation of research into the practice environment through dissemination and sharing of knowledge is an essential core skill. This project was outside my normal comfort zone of expertise as a nursing professor. It was essential for me to spend significant time learning about delirium and the impact it has on MS patients and bedside nurses. A tremendous amount of time was required to review existing literature, determine an evidence-based method to identify delirious patients, and implement a quality improvement project that improved patient outcomes and created a more effective practice environment. Within this context, I had to become an expert on delirium and its impact on the nurses and the population of a MS unit. Once I gained the appropriate knowledge, I was able to disseminate information to the staff and the administration of the hospital. The key to success in this area was analyzing the role of the stakeholders and empowering them to take ownership in the change process (see Kelly, 2011). This would not have been possible if the nursing staff and hospital administrators had not viewed me as a credible scholar. Thus, I was not a threat to the status quo but a source to encourage change and improve patient outcomes. My role as scholar and knowledge expert decreased the number of barriers that might traditionally hinder the implementation of a quality improvement project.

Project Manager

As a project manager, I fulfilled the goals of several DNP Essentials (AACN, 2006). Essential VI promotes the use of effective communication to develop and

implement new guidelines, lead teams, and use skills necessary to create sustainable change (AACN, 2006). Implementing a new component to the assessment of each patient meant requiring additional bedside time of each nurse. It was essential that I effectively communicate the importance of adding an additional assessment step to the routine and share the potential outcomes in order to gain the acceptance and generate enthusiasm among the nursing staff. Being able to walk on to a unit and challenge the process required significant leadership skill. As expected, there were staff who immediately embraced the change and others who were not as welcoming. To break down this barrier, it was important for me to role model professional behaviors to inspire staff to share my vision for change on their unit by encouraging them to take ownership of the vision. Encouraging and developing a trust relationship between the staff and myself was the foundation of my success. Transparency was important as I challenged the old established way of assessing patients and implemented a new assessment skill. Being open, honest, and available to the staff reduced fears and broke down potential barriers of staff opposition to change.

Finally, AACN's (2006) DNP Essential VIII strongly suggests the development of therapeutic relationships with the nursing staff to promote positive patient outcomes. Without the willingness of the staff to recognize the need for change and participate in improving patient care, the project would not have been a success. Enrollment milestones earned the staff simple yet creative rewards that fostered enthusiasm among team members. Continuous praise provided an awareness that I was fully cognizant of

the work added to their daily routine. These simple strategies improved buy-in from the staff and optimized the change process (see Zaccagnini & White, 2011).

The planning and implementation of this project has provided me with significant personal and professional growth. Being in school full-time and teaching nursing full-time tested my time management skills. The experts in my didactic courses at Walden University contributed to my knowledge base, mentored me through a variety of new experiences, and challenged me to excel. In the clinical arena, I was pushed to learn about delirium, of which I had little previous experience. However, I had the opportunity to work with a high quality administrative team at project hospital who sincerely desired to improve patient outcomes. They were supportive and listened when I suggested multiple changes were necessary to improve quality outcomes, then gave me the authority and support to make those changes. The exciting part was that the DNP project is only the beginning of the change at the project hospital. Therefore, I will continue to work with the organization to sustain long-term quality change facility-wide. The knowledge and skills I gained through my didactic and clinical coursework prepared me well to handle the challenges of the real world.

Summary

In this quality improvement project, I provided multifaceted educational training to nurses who implemented the CAM delirium detection tool into practice and successfully identified delirium in the local patient population. This quality improvement project supported two of the five risk factors previously identified in the research by Inouye and Charpentier (1996). For successful implementation of quality improvement

projects into practice, researchers must provide clear, concise, and transparent leadership (Zaccagnini & White, 2011). This translates into staff ownership and buy-in for the change on the unit. Nurses who take pride in their work improve patient's outcomes and lead to higher patient satisfaction rates (Kelly, 2011).

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Appendix A: Delirium and the Confusion Assessment Method Pretest

Circle the appropriate answer

1. Current healthcare costs related to delirium in the US total _____ a year.

   a. 1.4 million
   b. 28 million
   c. 1.4 billion
   d. 164 billion

2. Nationally the percentage of hospitalized patients diagnosed with delirium is estimated at?

   a. 20%
   b. 40%
   c. 60%
   d. Difficult to ascertain

3. In the local population at this hospital, the percentage of hospitalized patients diagnosed with delirium is estimated at _____.

   a. <1 %
   b. 20%
   c. 40%
   d. 60%

4. The average length of stay for a patient diagnosed with delirium at this is?

   a. 2.14 days
   b. 4.42 days
   c. 6.87 days
   d. 8.78 days

5. Delirium can be characterized as:

   a. A loss of appetite
   b. A progressive loss of memory
   c. A change/fluctuation in a patient's baseline cognitive status
   d. Sleep deprivation

6. Sarah Gentry is restless, trying to crawl in and out of bed, she fluctuates between crying and laughing and is very concerned that her dog get let out. Which type of delirium does her current behavior represent?

    a. Hypoactive delirium
    b. Hyperactive delirium
    c. Mixed delirium
    d. Subsyndromal delirium

7. Mark Lazone is restless, trying to crawl in and out of bed, fluctuates between angry outbursts and a calm demeanor, but listens carefully as you speak to him. Which type of delirium does his current behavior represent?

    a. Hypoactive delirium
    b. Hyperactive delirium
    c. Mixed delirium
    d. Subsyndromal delirium

8. Which type of delirium is most commonly found on medical/surgical units?

    a. Hypoactive delirium
    b. Hyperactive delirium
    c. Mixed delirium
    d. Subsyndromal delirium

9. Delirium is typically caused by one single precipitating factor in the hospitalized patient.

    a. True
    b. False

10. Reducing the prevalence of delirium, through early identification, may lead to:

    a. Reduced hospital costs, decreased use of restraints, and diminished 30-day re-admission rates
    b. Reduced hospital costs, decreased use of restraints, and increased 30-day re-admission rates
    c. Reduced hospital costs, increased use of restraints, but diminished 30-day re-admission rates
    d. Reduces hospital costs, decreased use of restraints, but increased 30-day re-admission rates

11. The five independent risk factors used to predict delirium by Inouye & Charpentier are:

    a. Use of physical restraints, malnutrition, greater than three medications added, use of an NG tube, and an iatrogenic event
    b. Use of physical restraints, smoking, greater than three medications added, use of an NG tube, and an iatrogenic event
    c. Use of physical restraints, malnutrition, greater than three medications added, use of a bladder catheter, and an iatrogenic event
    d. Use of physical restraints, smoking, greater than three medications added, use of a bladder catheter, and an iatrogenic event

12. Which situation best describe some of the risk factors found in patients at this hospital?

    a. Male, high fall-risk, use of a bladder catheter, greater than three medications added
    b. Female, high fall-risk, single, use of an NG tube
    c. Male, low fall-risk risk, single, use of amphetamines
    d. Male, single, currently taking benzodiazepines, respiratory-related illness

13. Research shows that nurses are well equipped to identify patients experiencing delirium.

    a. True
    b. False

14. The CAM feature one demonstrates:

    a. Overall cognitive impairment
    b. Increased lab values that contribute to mental status changes
    c. The types of medications the patient is currently taking
    d. Orientation

15. Which of the following scenarios demonstrates delirium according to the Confusion Assessment Method (CAM)?

    a. Acute onset, waxing and waning course, normal attention span but disorganized thinking, and an altered level of consciousness
    b. Acute onset, steady course, inattentiveness, disorganized thinking, and an altered level of consciousness
    c. Acute onset, waxing and waning course, limited attention span but alert, and disorganized thinking
    d. Acute onset, waxing and waning course, in attention, disorganized thinking, and an altered level of consciousness

Demographics

Please provide the following demographics by circling and/or writing in the answers that best describe you. *No data will be directly linked to you personally but will be aggregated together to form a profile of all medical floor nursing staff* who complete this form.

Age:

18 – 29
30 – 39
40 – 49
50 – 59
60 – 69

Gender

Male

Female

Please provide the last 4 digits of your personal phone number.
(to track data between tests only)

_____

How long have you practiced in this role?

Less than 1 year
1 – 4 years
5 – 9 years
10 – 14 years
15 – 19 years
20 – 24 years
25 – 29 years
30 – 34 years
35 – 39 years
More than 39 years

How many hours a week, do you usually work?

0 – 12 hours

13 – 24 hours

25 – 36 hours

More than 36 hours

What is the highest degree of nursing education you have completed? (*if currently enrolled, highest degree received*)

Associate's degree
Bachelor's degree
Master's degree
Doctoral degree

Do you have a specialty nursing certification?

Yes
No

Appendix B: CAM Short Form

Place patient label in this box

Not a part of the permanent record

Project Hospital
Delirium Study
Confusion Assessment Method (CAM) Short-Form

Answer the following questions by checking the appropriate corresponding box if you identify a **change** in your patient's mental status.

1. Feature 1: Acute onset and fluctuating course (this information may be obtained from family members or caregivers) Is there evidence of an acute change in mental status from the patient's baseline? And does this behavior fluctuate during the day (tend to come and go, or increase or decrease in severity?	No _____ Yes _____
2. Feature 2: Inattention Does this patient have difficulty focusing attention (easily distractible or have difficulty keeping track of what is being said)?	No _____ Yes _____
3. Feature 3: Disorganized thinking Is the patient's thinking disorganized or incoherent, such as rambling or irrelevant conversation, unclear or illogical flow of ideas, or unpredictable switching from subject to subject?	No _____ Yes _____
4. Feature 4: Altered level of consciousness Overall, how would you rate the patient's level of consciousness? (put a check mark on the line) _____ Alert (normal) _____ Vigilant (hyperalert) _____ Lethargic (drowsy, easily aroused) _____ Stupor (difficult to arouse) _____ Coma (unarousable) For Alert check **NO**; for any of the other conditions check **YES**	No _____ Yes _____
If "yes" is checked for feature 1 and 2 and either 3 or 4 then delirium is suggested	

_____ nurse signature (legibly)

_____ date/time

Please place completed CAM in manila envelope at nurses' station.

Adapted from Inouye, S. K., et al. (1990). Clarifying confusion: The confusion assessment methods: A new method for detection of delirium. *Annals of Internal Medicine, 113*, 941 – 948.

Appendix C: CAM Use Permission Form

Michaelynn Paul

From: Asha Albuquerque <AshaAlbuquerque@hsl.harvard.edu>
Sent: Tuesday, November 25, 2014 11:01 AM
To: Michaelynn Paul
Subject: RE: CAM request: Walden University

Dear Michaelynn,
Thank you for your interest in the CAM. You have Dr. Inouye's permission to use the CAM for clinical and academic purposes. You must respond to this email indicating your acceptance of the disclaimer below. We are unable to provide a formal letter for IRB approval. However, you may accept this email as our approval. The CAM (long and short versions) and their associated training manuals are available for download at our website, http://www.hospitalelderlifeprogram.org/delirium-instruments/. The CAM (including the CAM-S) should be used in accordance with training and procedures outlined in the Training Manual. Please note that brief cognitive testing is recommended for validly scoring the CAM. At a minimum, testing of orientation and sustained attention is recommended (e.g., digit span, days of the week backward, or months of the year backward).

We ask that you include the acknowledgment below on any references to or replications of the CAM:
"Confusion Assessment Method. © 1988, 2003, Hospital Elder Life Program. All rights reserved. Adapted from: Inouye SK et al. Ann Intern Med. 1990; 113:941-8."

Should you choose to use the CAM in any publications in the future, we request that you inform our office and share the publication with us as soon as possible.

Due to liability and copyright restrictions, we cannot allow the CAM instrument or related manuals to be posted on any other websites. We also prohibit the use of the CAM in smartphone applications or training videos. However, we are happy to have you provide a link to your users to our website: http://www.hospitalelderlifeprogram.org/delirium-instruments/.

Disclaimer:
The CAM is intended to assist with identifying the symptoms of confusion or delirium and is intended to be used as instructed. An accurate diagnosis for delirium, confusion, or other psychiatric disorders can only be made by a qualified healthcare provider or physician after a clinical evaluation. These materials are not intended to address the many situations that may arise in dealing with delirium, and persons must exercise their independent judgment about such clinical situations. The Hospital Elder Life Program, LLC., Dr. Sharon K. Inouye, MD or Hebrew SeniorLife shall have no liability for claims by, or damages of any kind whatsoever to, a user of this content or any other person for a decision or action taken in reliance on the information contained on this web site. Such damages include, without limitation, direct, indirect, special, incidental or consequential damages. You expressly agree that the Hospital Elder Life Program, LLC, Sharon Inouye, MD and Hebrew SeniorLife are not liable for any injury, physical or financial, related to the content or your reliance on the content. Your use of these materials constitutes your agreement to the provisions of this disclaimer. Please initial below in agreement of the terms.

- I have read and agree to the terms of the CAM disclaimer: _____

If you should have any further questions, please contact us at AgingBrainCenter@hsl.harvard.edu

Asha Albuquerque
Research Assistant

Aging Brain Center
Institute for Aging Research
Hebrew SeniorLife
1200 Centre Street
Boston, MA 02131
Phone: 617 971 5414

Applicant Details
Michaelynn Paul, RN, MS
Walden University
Michaelynn.Paul@wallawalla.edu<mailto:Michaelynn.Paul@wallawalla.edu>

How do you plan to use the CAM? (check all that apply):

- Academic purpose, nonprofit (e.g., nonprofit academic uses, including student or university faculty papers, presentations, or student or faculty research for nonprofit academic purposes),
- Clinical use, nonprofit (e.g., direct patient care in a nonprofit setting),
- Educational or training purposes, nonprofit (e.g., training of students, hospital staff, families, caregivers in nonprofit settings),
- Academic publication in a journal

Please describe in detail how the CAM will be used.
The CAM will be used by the medical floor staff to assess the presence of delirium. It is part of a quality improvement project that is required for graduation from the DNP at Walden University. The nurses will received education on using the CAM and then implement in during the quality improvement project. We will also be looking at Dr. Inouye's 5 risk factors of delirium and their prevalence in the local population of one hospital. Since this is for completion of a graduate degree I will need written permission on letterhead for IRB approval. if you have further questions please let me know.

If you plan to use the CAM in a clinical trial, please describe the funding source.
NA

Best,
Asha

Appendix D: Postimplementation Survey

Post Implementation Survey

	Strongly Agree	Agree	Disagree	Strongly Disagree	Please provide an additional comment for any statement but specifically if you chose disagree or strongly disagree
1. I feel confident in my ability to successfully use the CAM.	1	2	3	4	
2. If I had a question regarding administration of the CAM, I would know who to go to for support.	1	2	3	4	
3. The training manual provided helpful easy to access information regarding administration of the CAM.	1	2	3	4	
4. I feel that incorporating the CAM into the daily assessment routine could improve patient outcomes.	1	2	3	4	
5. I felt supported by the researcher during the project period.	1	2	3	4	
6. I felt supported by hospital management during the project period.	1	2	3	4	
7. What would make it easier to use the CAM?					